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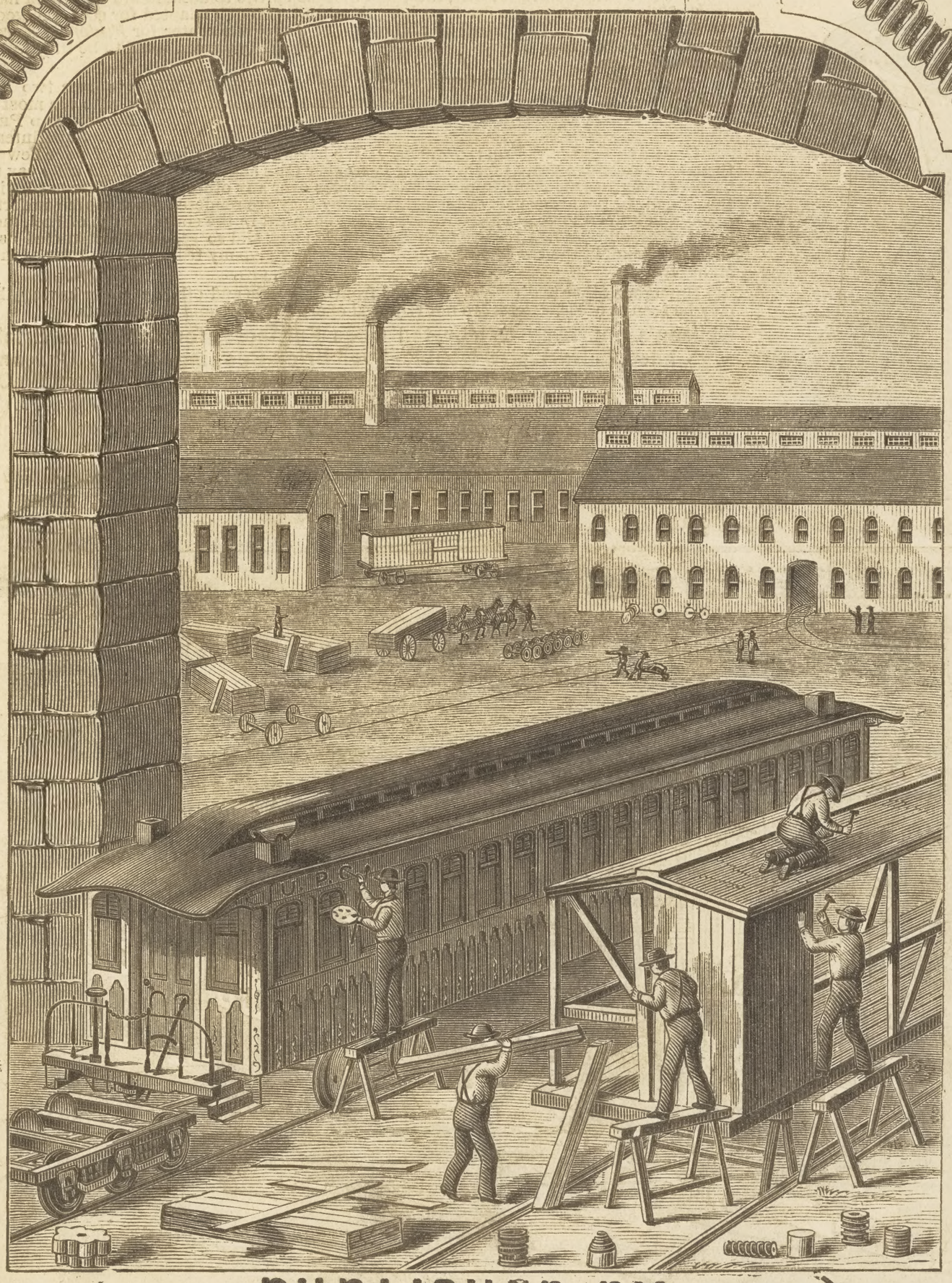
THE NATIONAL CAR BUILDER.

Devoted to the Interests of Railway Rolling Stock.

Vol. VI

JANUARY, 1875.

No. 1.

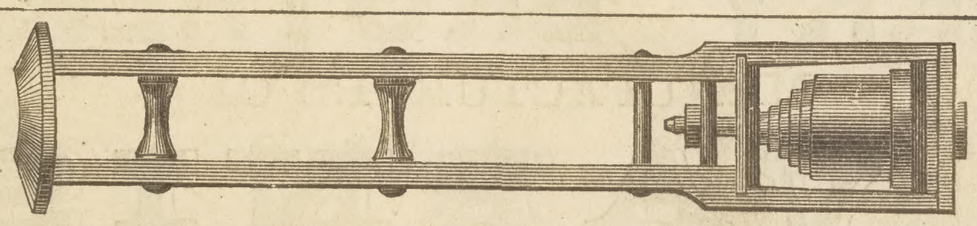


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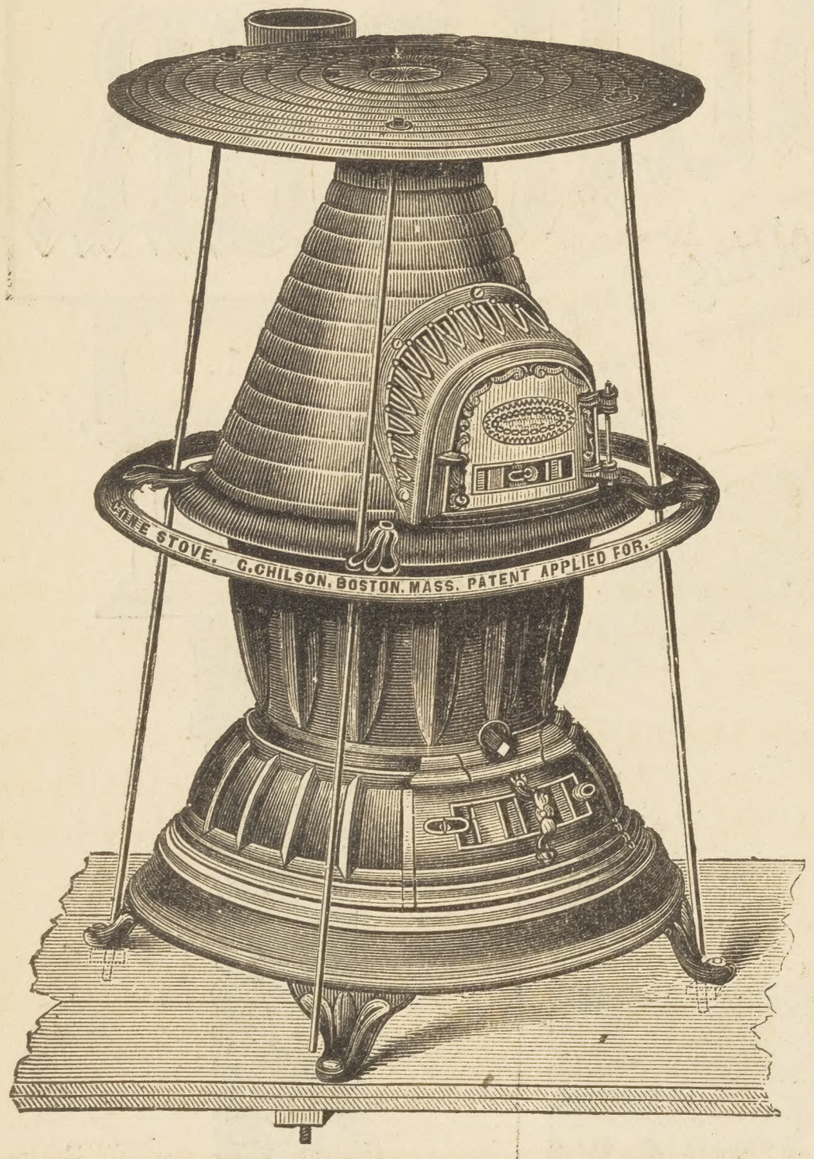
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1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.

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3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stoves.

4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.

5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*

6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories, Stores, Offices,* RAILROAD CARS, and STATION HOUSES, *School Rooms, Workshops, etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

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Yours, etc.,
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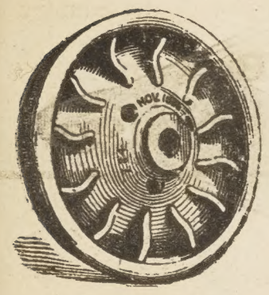
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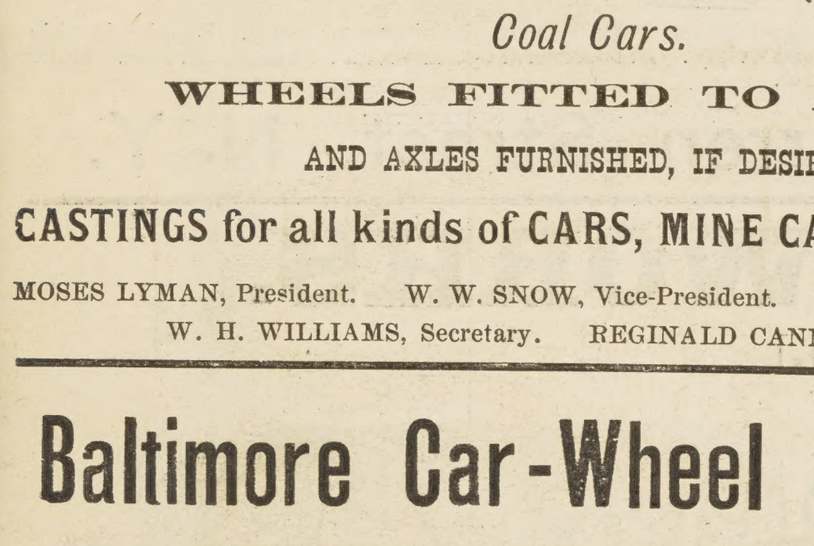
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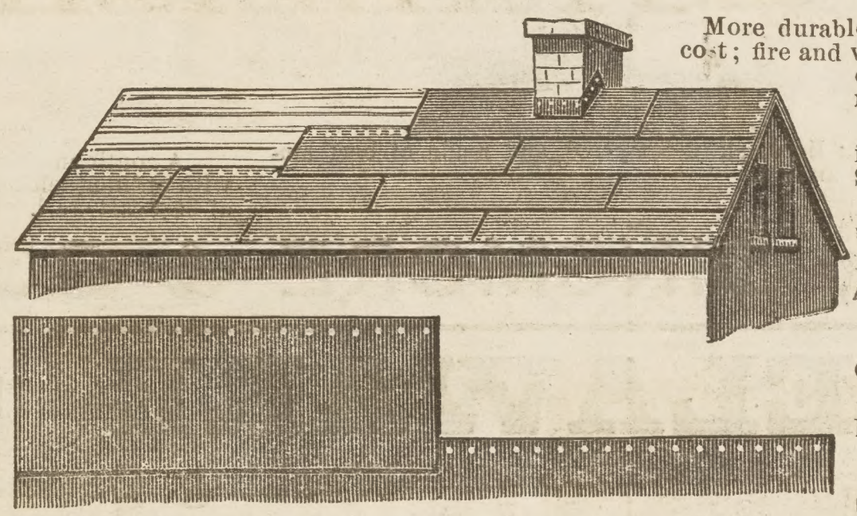
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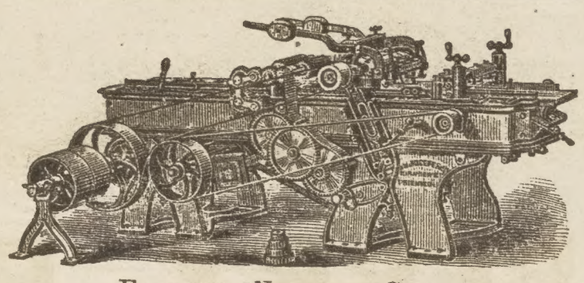
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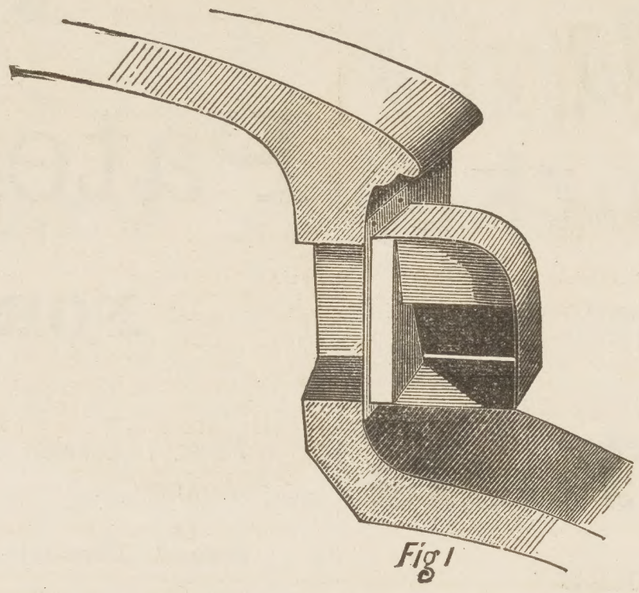


Fig 1

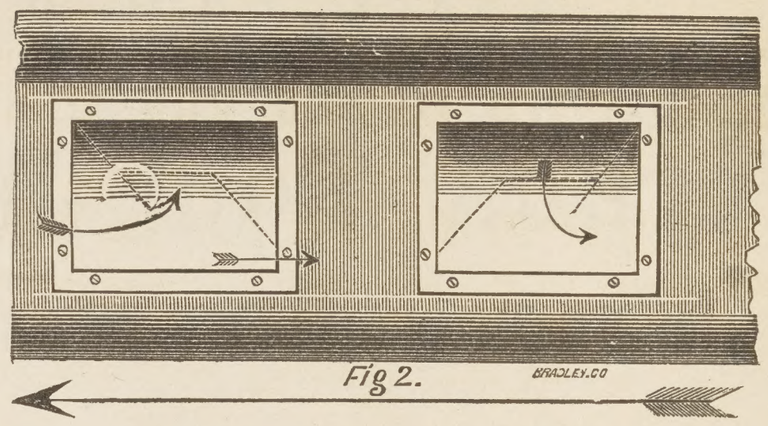


Fig 2. BRADLEY.CO

THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place, it is always in readiness, and runs itself independent of all employees.

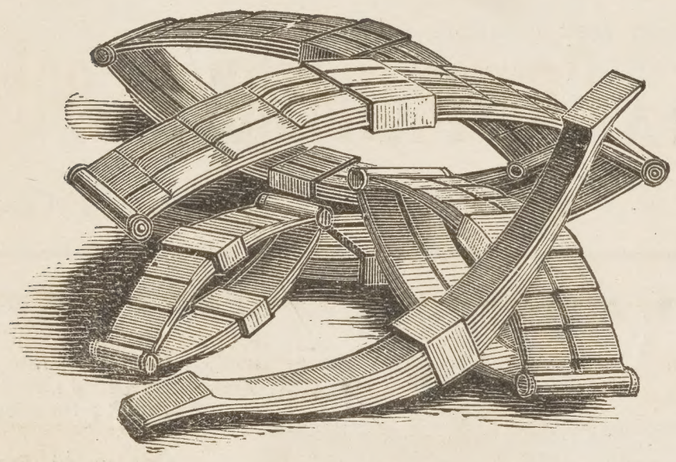
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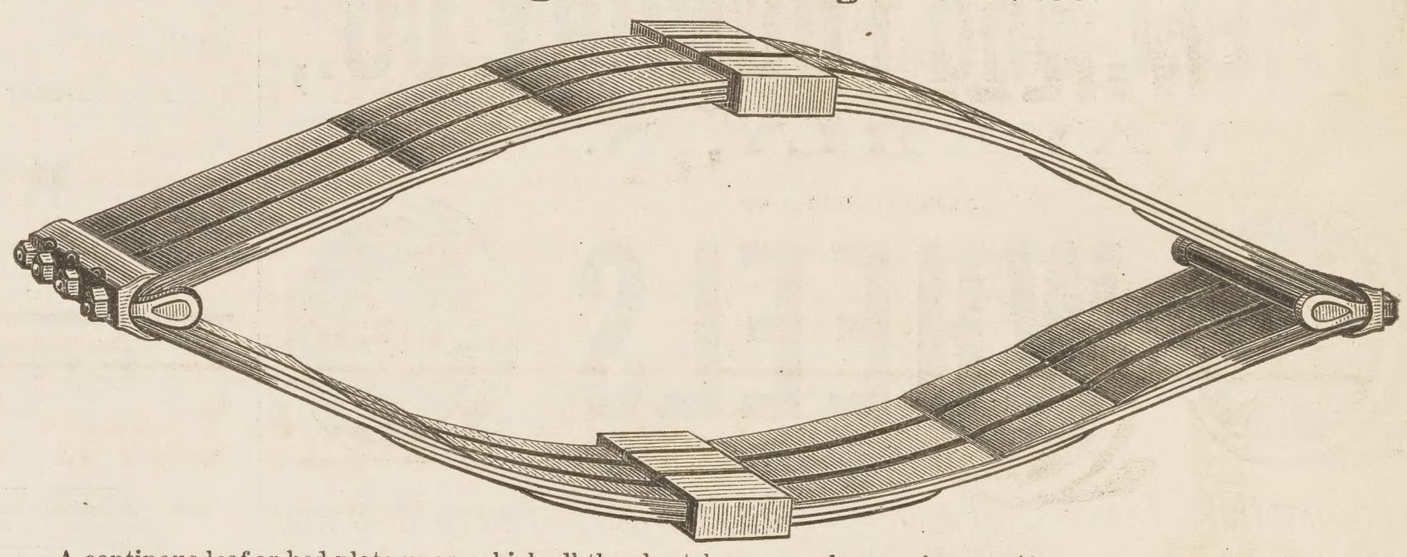
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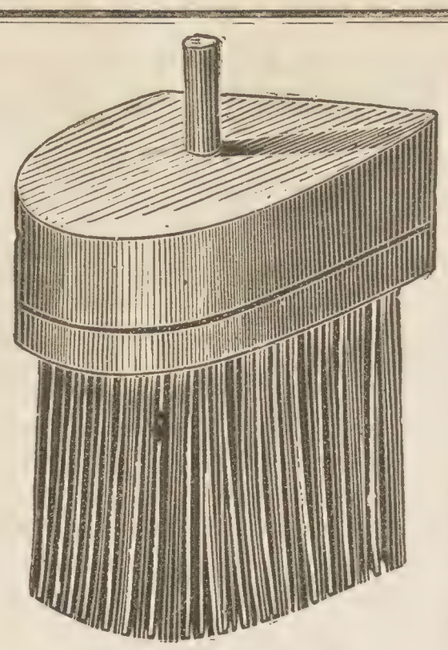
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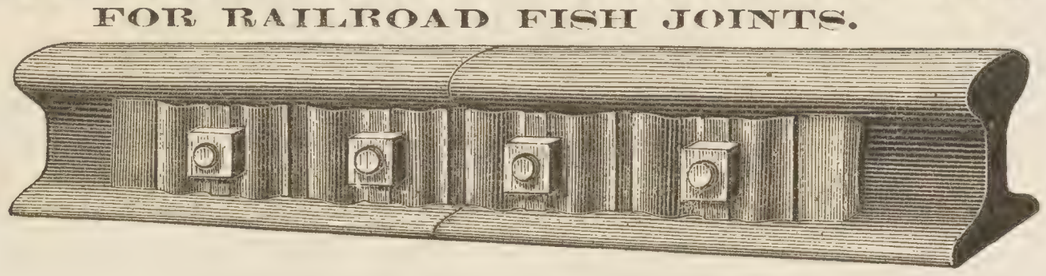
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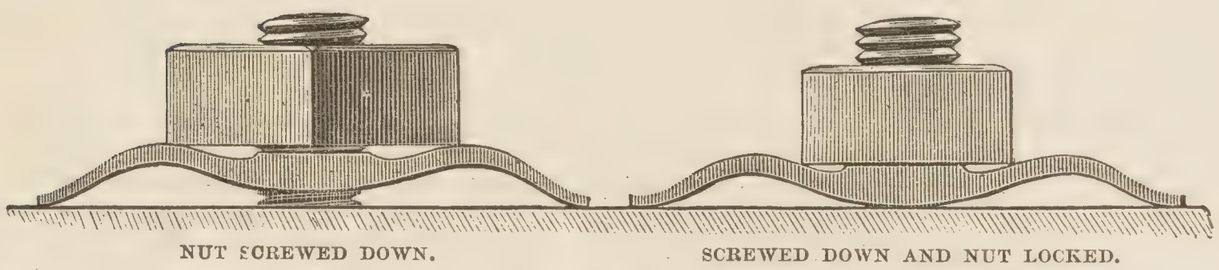


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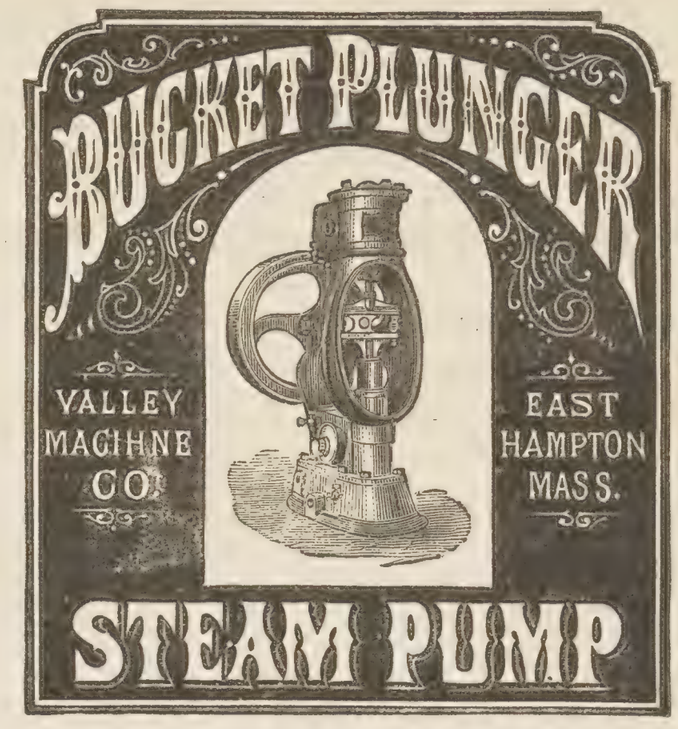




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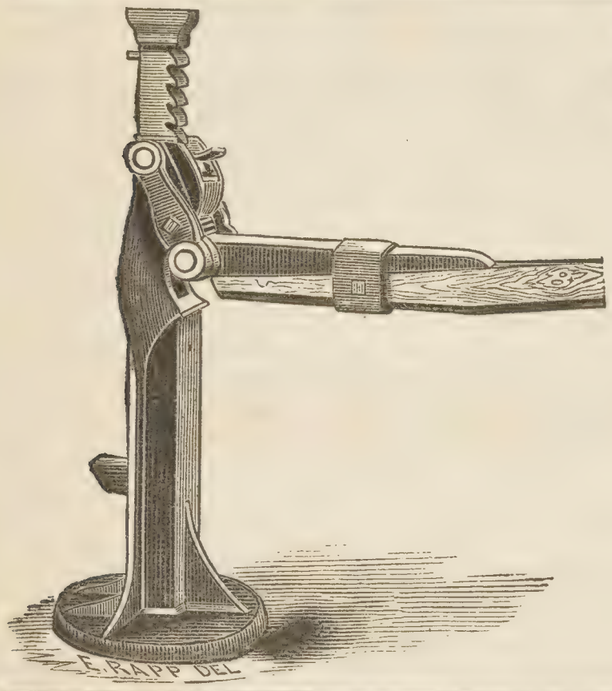
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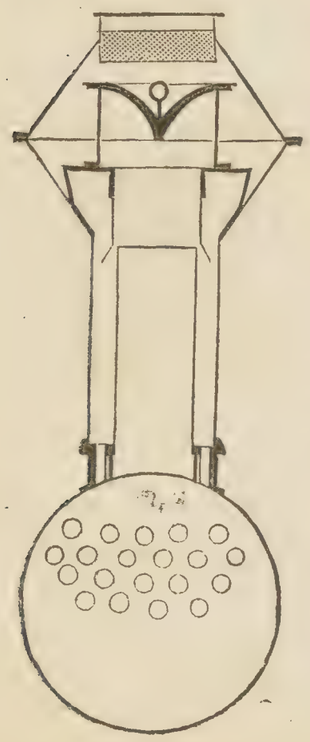
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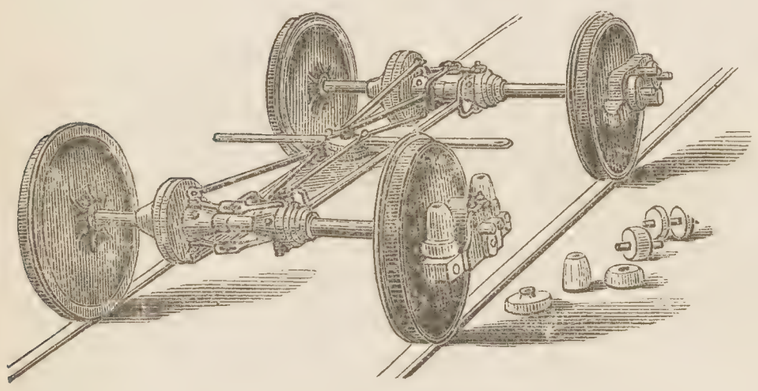
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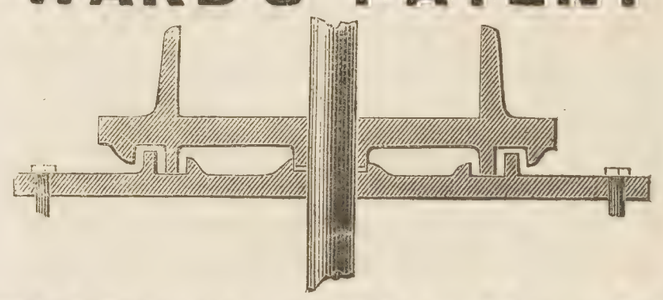
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With Oil Receptacle for Bearing-Ring to work in. They are acknowledged to be the best in use. See description and drawings in CAR-BUILDER for January, 1874.

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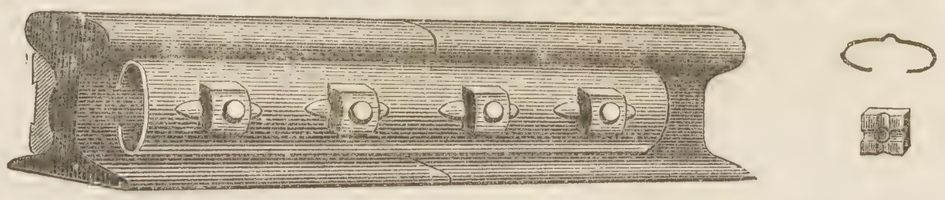
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A Combined Nut-Lock and Fish-Plate. The Nuts are securely held in place by a Steel Plate or Rib, and protected from jar and vibration. Costs no more than ordinary wrought-iron plates.

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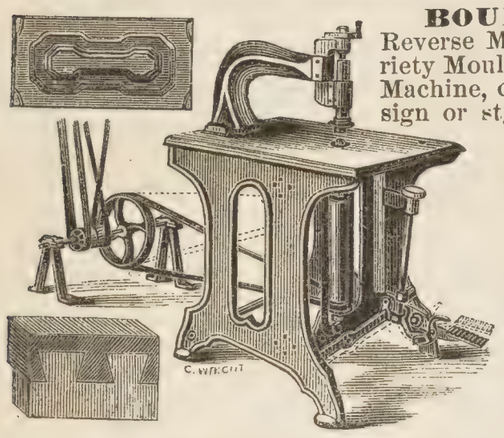
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Reverse Motion, Paneling, Variety Moulding and Dovetailing Machine, cuts Panels of any design or style of Mould in the solid wood, with neatness and dispatch.

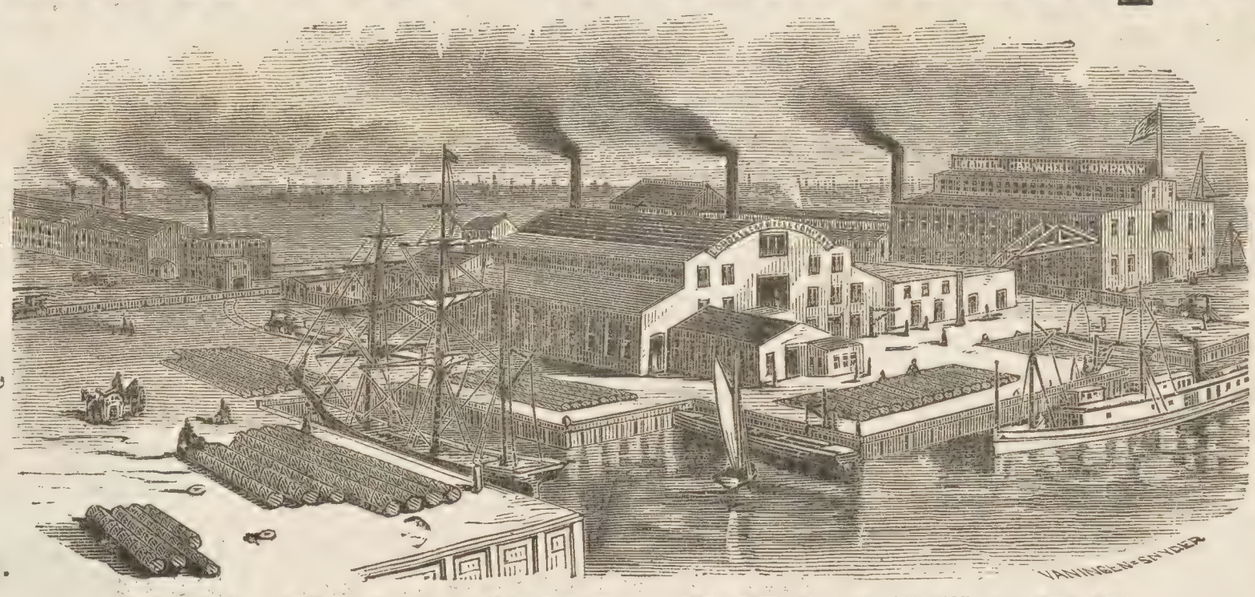
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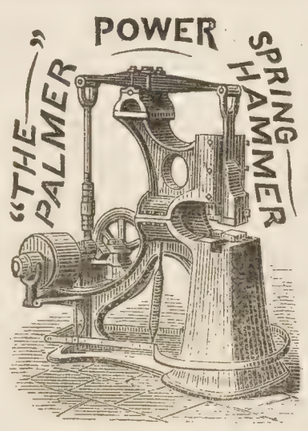
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Superior in every point to any modification of the Trip Hammer.

Simple, Powerful,

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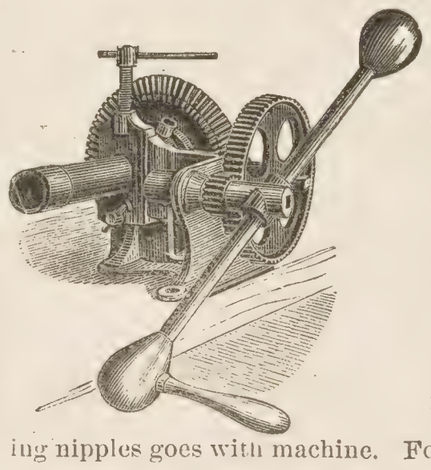
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CHASE'S

Pipe-Cutting and Threading Machine.

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This important tool is designed to fill a want long felt by STEAM AND GAS FITTERS AND MACHINISTS for cutting and threading pipes rapidly and cheaply. An Apprentice Boy, with one of these, can do more work than Two Men with old appliances under the old system. No PIPE SPLITTING! No BEVEL INSIDE OR OUT! It cuts threads and makes nipples for all sizes of pipes, from ⅛ to 2 inches. Weighs only 100 lbs. Stronger than any machine made. A full set of collars and lengths for making nipples goes with machine. For Sale by

MORRIS, TASKER & CO., Philadelphia, New-York, and Boston.

Address.

The Chase Manufacturing Co.,

120 Front St., New-York.

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MURPHY & CO., | MURPHY, SHERWIN & CO.,

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Varnish Makers.

We call attention to the following prices of our Varnishes especially adapted to Railway Uses, and submit that they combine more prominently than any others, the INDISPENSABLE REQUISITES for Railway Consumption. They are of heavy body, light color, quick drying, and are guaranteed to give a maximum of durability.

Wearing Body, (For Outside Finishing.)	**$5 50**
Hard-Drying Body, (For Under Coats on Cars.)	**5 00**
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Black Enamel, (For Smoke Stacks of Engines.)	**3 00**
No. 1 Black, (For Iron-Work.)	**1 50**

The use of these goods has long since ceased to be experimental. They have been longer in use, upon more prominent roads and with better satisfaction, than any other Varnish of either foreign or domestic make. UNIFORM SUPERIORITY IN QUALITY AND FIXED PRICES TO ALL will continue to characterize them, and Satisfaction in their use is assured.

THE DISNEY CAR COUPLER,

Patented June 24th, 1874. Manufactured by

F. E. CANDA & CO.,

CHICAGO, ILL.

Fig. 1.

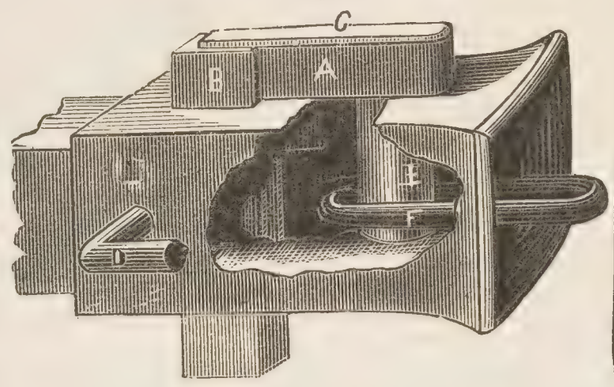


Fig. 2.

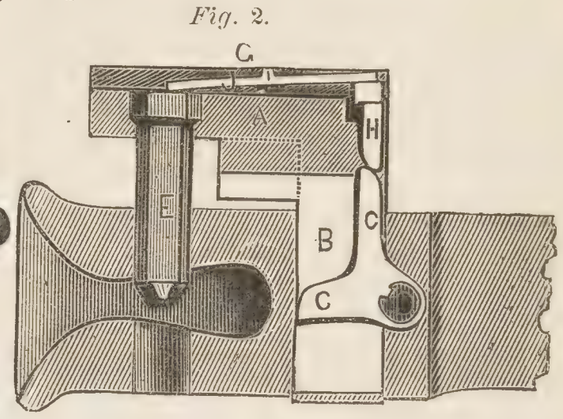


Fig. 1 represents the draw-head with a portion broken away to show the interior.

Fig. 2 represents a vertical, sectional view. *A B* we designate *The Drop*, the upper part *A* serving as the pin-holder. *D* is a lever by which the device is operated, fastened to a shaft passing through the draw-head. *C C* is a forked piece keyed to this shaft. *H* is a small loose pin. *E* is the large pin for securing the link *F*. *J* is a lever resting on the heads of pins *E* and *H*, with its fulcrum on cap-piece *G*. *Then*, when set for coupling or uncoupling, as in Fig. 2, the link *F*, in passing the mouth of the draw-head, raises pin *E*, which by lever *J* forces pin *H* against and displaces the upper arm of *C C*, allowing the *drop* to fall, carrying pin *E* with it.

From the above cuts and description it is apparent that this device combines simplicity in its construction, reliability in its working, and durability in all its parts.

We designate as points of special advantage:

That working from the side of the draw-head, it leaves no opening at the top for dirt, gravel, or accumulations of ice and snow to interfere with the working of the coupler.

That, while the link is always held in a horizontal position for entering, yet it has sufficient vertical movement to accommodate itself to cars of different heights, not exceeding a variation of six inches, without using the crooked link.

That the mouth of the draw-head is of such shape as secures the pin from all liability of bending or breaking.

That it always couples when desired, or set for coupling, and will *never* couple when not desired.

That, working readily from the top and sides of cars, there is no risk of life or limb.

That the pin can never be lost or stolen.

And further, that from its reliability of working, and durability of parts, combined with the device for securing it to passenger cars, makes *This Coupler* the safest and by far the most economical *Passenger Car* Coupler ever introduced.

The Disney Car Coupler, wherever tried or however thoroughly tried, has given the most perfect satisfaction, both as a Freight and Passenger Car Coupler.

For further information, address

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AND

F. E. CANDA & CO., Railroad Contractors and Car Builders,

79 SOUTH CLARK ST., CHICAGO, ILL.

THE NATIONAL CAR BUILDER.

DEVOTED TO THE INTERESTS OF RAILWAY ROLLING STOCK.

Vol. VI. No. 1. JANUARY, 1875. *$1.10 per Annum. Single Copies, 10 Cents.*

The Bessemer Steamship.

THIS steamship is designed by Mr. Bessemer to carry passengers across the Channel between Dover and Calais as comfortably as over a mill-pond. The vessel, which was recently launched at Hull, England, is 350 feet long at the water-line. Each end is rounded off, and nearly the shape of a cigar. A rudder at each end, fixed after the fashion of our ferry-boats, enables the vessel to steam in either direction, and turning round in harbor is rendered unnecessary. The decks at each end being low, and the sides of the ship being rounded off, she will make the least possible resistance to the water. This will insure steadiness as well as speed. There are two pairs of engines, one set at either end of the ship, and each having two cylinders of eighty inches in diameter and a stroke of five feet, working with steam of thirty pounds pressure per square inch, supplied from four box-shaped boilers, each boiler having four large furnaces. The engines are oscillating and expansive, working up to 4600 horse-power, which, should it be required, can be increased to as much as 5000, but it is expected that the former will be quite sufficient to drive the ship at the speed of twenty miles per hour. The paddle-wheels, of which there are a pair on either side of the vessel, are twenty-seven feet ten inches in diameter outside the outer ring, and each wheel has twelve feathering floats. It is expected the leading pair of wheels, when working at full speed, will make thirty-two revolutions per minute.

The grand expedient adopted in the Bessemer steamship for the prevention of sea-sickness is a central cabin, hung in the ship somewhat as a compass is in a box. No matter how much the ship may roll, this cabin will remain level, and it is thought the passengers will feel no more motion than they would on dry land, except in the case of heavy pitching, against which no precautions are practicable. Entrance to the Bessemer saloon is gained by two broad staircases leading to one landing, and thence through a flexible passage. The saloon rests on four steel gudgeons, one at each end, and two close together near the middle. These are not only employed to support the saloon, but are also utilized for conveying the water to the hydraulic engines by which the saloon is kept steady. For this purpose the after one has been made hollow, and is connected with the water-mains from two pairs of powerful engines, and also with a supply-pipe leading to a central valve-box, by means of which the two hydraulic cylinders on either side are supplied with water. Between the two middle gudgeons is placed a gyroscope, worked by a small turbine filled with water from one of the gudgeons. The introduction of this gyroscope has enabled Mr. Bessemer to dispense with the services of a man, and has thus completed his scheme of a steady saloon by making the machinery completely automatic; but should at any time the gyroscope fail to act, it is so arranged that a man can at once take charge of the controlling machinery, and thus prevent the cabin from becoming useless for its first object. The saloon is seventy feet long, thirty-five feet wide, and twenty feet high. On the left-hand side, just within the apartment, is a spacious staircase leading to the top, thus enabling passengers to enjoy the sea-breeze, and at the same time to be free from feeling the motion of the ship, and this without having first to traverse any portion of the vessel proper. On the right-hand side of the engine is a retiring-room, so that if even in the saloon any person should find the "sea air" too much for him, he can withdraw from the public gaze. Ranged round the saloon is a row of seats, and the sides are ornamented in a very tasteful manner with panels.

One great desideratum in a ship's saloon is good ventilation, and this has been attended to with the greatest care. Two fans or blowers are employed, and are worked by the small auxiliary engine. One fan forces fresh air into long tubes passing under the seats and throughout the whole length and breadth of the saloon, and the pipes are punctured with small holes, so as not to create a draught in any particular part.

Pullman Palace-Cars.

MR. GEORGE M. PULLMAN, President of the Pullman Palace-Car Company, in compliance with the request of the Senate Committee on Transportation, addressed to the chairman a letter setting forth the relations of the company to railway companies, and giving a detailed statement of the system under which the cars are operated. The letter was written some months ago, and has just been published with the report of the committee. We append a summary of its leading points as published in the *Railway Review*:

Allusion is made to the condition of things prior to the organization of the company, pointing to such an organization as its remedy. Sleeping-cars, originally adopted about 1858 by a few leading roads, were imperfect in many respects, being constructed under a variety of patents and devices, not yet perfected by experience, and confined to particular lines not constituting through routes, where the run was long enough to occupy an entire night. The utility of these, however, suggested the desirability of a similar system between far-distant points, over connecting lines of road which in their individual capacity could not be expected to utilize the many different devices in one common system. And even had this been attained, the working relations of the different lines could hardly have been equitable and harmonious. Moreover, the score of details essential to the perfection of such a system (such as supplies and changes of linen, and devices for heating and ventilating) were foreign to the business of railway operation, and could receive due attention only from a company organized for this especial purpose. It was the solu- of this problem which engaged the attention of Mr. Pullman: to build cars embracing inventions and improvements perfected by the best ingenuity and skill, and meeting the just demands of the traveler, securing the roads a fair equivalent for their service, and providing a fair return upon the capital invested.

These necessities, under which Mr. Pullman's enterprise was built up and perfected, led to the arrangements now provided for in the contracts of this company with the roads, and which we summarize: The Pullman Company contracts to furnish its cars for a period of 15 years, and give each company the option, within a reasonable time, to purchase one-half interest therein at their cost, with no charge for use of patents, and to share equally with the Pullman Company in the results of the business; the Pullman Company to provide the number and kind of cars required by the railway companies to meet the demand; to furnish employees, subject to the regulations of the railway companies; the railway companies to control the movement and use of the cars as if they were their own, receiving the whole of the railway fares, thus saving the capital otherwise invested in building cars; the Pullman Company deriving revenue from rental of berths; the railway companies receiving the service of the cars free of cost, and maintaining them as if their own, with the exception of the carpets, upholstery, and bedding, constituting that portion pertaining to the sleeping accommodations which require frequent renewals. More than 60 railway companies in the United States and Canadas have entered into such contracts. Some have become participants in the entire business by subscribing to the Pullman Company stock at par, and receiving the usual dividends; others by associations as joint owners with the company, providing half the capital and sharing equally in the results. The prosecution of this enterprise, step by step, has demonstrated the paramount importance of constructing cars which shall meet every want of the traveling public, combining convenience of arrangement and elegance of finish with strength, guaranteeing safety to the passengers, and insuring to the railway companies the minimum of ordinary repairs, and avoiding overloading. The Pullman car only exceeds the weight of the 12-wheel cars by about 2½ tons, the excess being in consequence of bedding and partitions. The cars are used on over 30,000 miles of road in this country. The company claims to have rendered the traveling public substantial benefits in a system by which cars are not only run through without change between far-distant points and over distant lines, in charge of responsible through agents, to whom ladies, children, and invalids are safely intrusted, but, by a number of ingenious devices, to have greatly improved the comfort, safety, and healthfulness of passenger-cars, and making night journeys convenient and easy.

The aim of the Pullman Company is thus to do a work in connection with the railway companies which they separately could not so well perform. An organization was therefore needed to amicably unite all the different interests for the better service of the

public, and to combine, in one class of car and one system, as only a single company could, all needful improvements for the convenience, safety, and comfort of the traveler, so as to enable the public to use the different railway lines as though they were all under one management. In this view Mr. Pullman expresses the opinion that the public will never consent to return to the old plan of frequent changes and broken travel, but will even demand further improvements. The company has no doubt it can furnish these should its efforts be as thoroughly seconded by the railways in the future as they have been in the past.

The Cost of Transporting Freight.

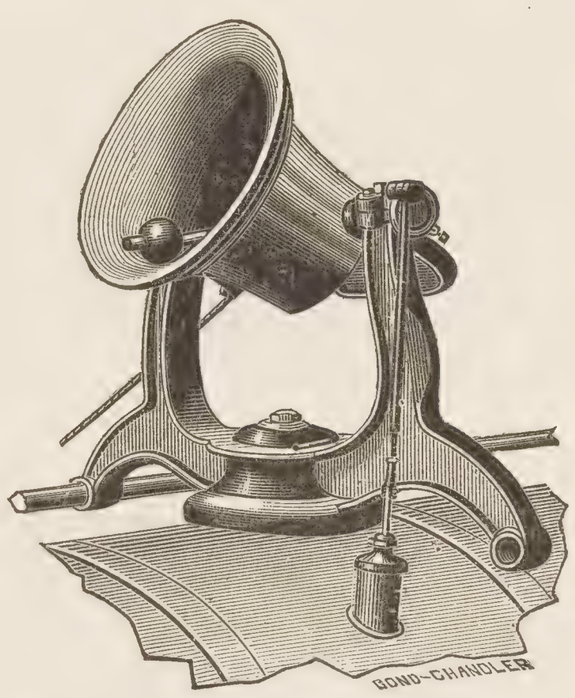
A COMMITTEE of the New-England Association of Railroad Superintendents submitted a report at the November meeting upon the cost per ton per mile of moving freight upon eight railroads leading out of Boston, such report being based upon the information and data contained in that of the Massachusetts Railroad Commissioners for 1873. The committee say that the accounts kept and the returns made by the railroad companies, and the estimate of such cost made by the commissioners, are not reliable; and that the true cost will never be known until a railroad is built and operated exclusively for freight, when the exact average cost of moving a ton of freight one mile can be determined. We append the following extract from the committee's report:

"The construction and condition of one road differs so from another—no two being alike—that the cost of transporting freight over them must, of necessity, be as unlike and variable as their condition. One road is nearly straight and level, and another has sharp curves and heavy grades; and the cost of moving freight over them will be, all other things being equal, in the ratio of their grades and curves. It is estimated that, 'taking the speed of freight trains at fifteen miles an hour, the resistance on a level is equal to 9.3 pounds per ton, and the total resistance due to a thirty-foot grade is equal to 22.4 pounds per ton.' If this statement of the case be correct—and we have no reason to question its accuracy—then the cost of moving freight over a road with a thirty-foot grade is about 150 per cent, or as 9.3 is to 22.4, more than over a level track.

"Another item which enters largely into the cost of hauling trains, more perhaps than is generally supposed, is the condition of the road-bed. If it is well ballasted, is level and in line, with good sleepers and perfect joints, trains are moved over it with but little friction and but slight wear and waste to the rolling-stock, and with much less consumption of fuel than over a track which is poorly ballasted and out of level and line, and with poor sleepers and low and battered joints. Another factor which enters into the account is the kind of freight to be moved. It costs more than twice as much per ton to handle light and bulky articles than such as are compact and heavy—more to load and unload furniture and stove-castings than oil in casks or manilla in bales. The value of the goods and their liability to be damaged are also items which go to make up the cost. The distance the goods are to be hauled determines whether the terminal charges are to be distributed, as the case may be, over thirty, fifty, a hundred, or five hundred miles. Then we find that about sixty-three per cent of the cost of operating a railroad are mixed charges, part belonging to passenger and part to freight traffic, and we are not aware of any rule or method by which the exact per cent chargeable to each can be determined.

"The farmer might as well undertake to decide what per cent of the value of the golden corn that is ripening in his fields is due to the influence of the rain, the sun, and the earth, as the managers of our railroads, under the present system of running trains and keeping accounts, with any degree of accuracy, what it costs per ton per mile for the transportation of freight. Railroad commissioners and others may fix an arbitrary rate, or may guess at the cost and assume that it is correct, but such estimate is not and can not be based upon a demonstrable fact.

"Some people seem to think that railroad companies can and ought to carry freight and passengers at a nominal sum; that they are charitable institutions into which people put their money out of pure benevolence. Railroad managers endeavor so to arrange their rates of fare and of freights, that—with economy—in the aggregate, their net receipts shall be a fair and reasonable percentage on the capital invested. There is one thing which the public do not seem to understand, and which business men and boards of trade often lose sight of. If through-freight, or raw materials used for manufacturing purposes, or season-ticket or commutation-ticket passengers, are carried for less than cost—and it may sometimes, under strong competition, or for other causes, be good policy to carry freight and passengers at less than cost—the local freight, the regular ticket, or some other business must be charged enough in excess of its fair proportion to make up the loss. As a general rule, when it is found that a railroad is earning a fair dividend over its expenses, and an increase of business is offered, when some heavy freight or through business in large quantities can be obtained, the managers are not apt to calculate the exact cost of doing the increased business, or of charging its fair and just proportion of the cost of operating the road, but estimate only the cost of hauling, leaving out of the account a large number of items, such as repairs of road, repairs of buildings, taxes, insurance, damages, and the salaries of its officers."



Hudson's Locomotive Bell-Ringer.

THIS bell is designed to be rung by steam from the boiler, but it can also be rung by the cord when desired. An annular valve between the two heads of the piston covers alternately the supply and exhaust steam-ports, the lower head being perforated to allow the steam to abut against the end of cylinder. It is very effective in its working, uses a very small quantity of steam, and has no dripping of water from condensation. Mr. O. F. Hodge is the general agent, and may be addressed at Dubuque, Iowa. Sample ringers will be furnished to roads wishing to try them.

PROBABLY the oldest timber in the world, which has been subjected to the use of man, is that which is found in the ancient temples of Egypt. It is found in connection with stone-work which is known to be at least 4000 years old. This wood, and the only wood used in the construction of the temple, is in the form of ties, holding the end of one stone to another in its upper surface. When two blocks were laid in place, then it appears that an excavation about an inch deep was made in each block, into which an hour-glass-shaped tie was driven. It is, therefore, very difficult to force any stone from its position. The ties appear to have been the tamarisk or shittim wood. These dovetailed ties are just as sound now as on the day of their insertion.

Perfecting an Invention.

NOT long since an engineer was asked to test the performance of an important invention, and report upon its merits. As is usual in such cases, while preparations were being made to start the machinery, he examined it carefully, and conversed with the inventor, so as to become acquainted with all the details as fully as possible. The latter, after recounting his early efforts, his partial successes, and subsequent failures, turned finally to the machine before him, which he regarded as the realization of all his hopes, and spoke somewhat as follows: "I feel now that, after years of labor, having got the machine complete in every detail, I have reached the end of my rope. I fear that I have lived in advance of the age, and that, as I am an old man, I will not see the benefits which the public reap from my invention. I think I would be happier if there were still mechanical difficulties to be overcome, for the joy of conquering an obstacle more than overbalances the trouble that is caused by its occurrence." The inventor's wishes were destined to be fulfilled. Shortly after this impressive discourse, the machine was started, or, more properly speaking, an attempt was made to put it in motion. It frequently happens, however, that machines which are understood to perform very successfully in private, act in a very unbecoming manner when inspected by an engineer, note-book in hand. The present was a case of this description. In short, so many defects were discovered by the engineer in a few minutes, so many details that were incomplete, so many proportions that required to be changed, that the inventor was thoroughly convinced that his work was not yet done; and though he had discovered an important principle, it was as yet far from being practically realized.

This anecdote has been related for the purpose of calling attention to its moral, which, no doubt, many of our readers have already discovered. Indeed, there are several interesting deductions to be derived from the story. One of the most obvious is that a machine which seems to be perfect, as laid down in the drawing-room, presents many difficulties when subjected to a practical test. The chief reason of this is that the inventor is generally not an experienced engineer or mechanic. There are very few skillful designing engineers who have not reached a successful practice by extensive experience acquired through a series of failures. For example, the engineer referred to in the beginning of this article obtained ideas from his unsuccessful test of the machine of great value to him in his future work; and this fact suggests that an inventor, in embodying a new idea, would do well to entrust the matter to a skillful constructor, who, though he be not an inventor, has acquired such experience from their failures as to be able to carry into successful practice the idea advanced by another. This is generally what happens in the long run. The inventor, after a series of failures, becomes convinced that though he can invent, he can not construct, and finally seeks assistance from some one who makes a specialty of such things. It would be better if he could be brought to see the necessity of this action at the first; for in this way he would avoid the expensive failures which frequently leave him without the means of placing his invention before the public, just at the time when a little more outlay would demonstrate its value. There is a vast difference between an idea, however good it may be, in the mind of the inventor, and the same idea in form and practically at work.—*American Artisan.*

MR. LEWIS SCOFIELD, President of the Scofield Rolling Mill, in Atlanta, Ga., has patented a new process for making steel-capped rails, and they are now being manufactured in large quantity at that mill. It is claimed that the weld is perfect, that these rails will wear as long as the Bessemer, and that they can be made at a cost only $4 per ton more than iron rails. The steel is made by a new process, and it is claimed that the rails can be re-rolled as easily as iron rails.

Wythe's Self-Recording Speed-Gauge.

THIS instrument, which is illustrated by the engravings, is intended to indicate and record the speed of a railroad train during the whole period of its trip, and it is therefore used on freight-trains to enable managers to know how fast such trains run. The value of such knowledge is well known to railroad officers, and the utility of any device which will furnish a reliable record of the stoppages and varying speed of such trains, need not be dwelt upon. We copy the following description of the apparatus from the *Railroad Gazette*, to which we are also indebted for the engravings herewith presented.

The machine consists of clock-work shown on the right side of Fig. 1. This clock-work imparts a reciprocating movement to a pencil, *C*, which is attached to a sort of slide or cross-head, *I*, which slides on the rod *D D*. The cross-head moves the hole length of this rod and back again in one hour, and in doing this the pencil will trace a straight line on the paper *B*, wound around a drum, *A A*, provided the latter does not revolve, as is the case when a train stands still. The spindle or shaft of the drum has, however, a bevel wheel, *K*, attached to it, into which a bevel pinion, *L*, gears. The shaft *M* of this pinion is connected with gearing on one of the axles of the car, which causes the drum *A A* to revolve with the movement of the car, fast when the car runs fast, and slower when the speed is diminished. The strip of paper *B B* is ruled with longitudinal lines representing minutes of time, and with transverse lines representing distance — that is, miles or quarter miles. The paper has also printed on it the names of the stations at such distances as they occur, according to the scale. In some cases the grades and curves are also printed on the slip. It will be readily seen that when the paper is at rest, the pencil, driven by the clock, will draw a straight line across the paper, the length of the stop being indicated by the number of minute spaces drawn, while the varying speeds of the train will be shown by a diagonal line which varies from the perpendicular according as the speed increases, which can be readily ascertained by counting the number of spaces which cross a mile run. At the end of every half hour the pencil changes its direction by the mechanism alluded to, so that the diagonal line produced will be something like a zig-zag, or continuous letter W, with occasional perpendicular lines or curves that indicate the stoppage, switching, or backing of the train.

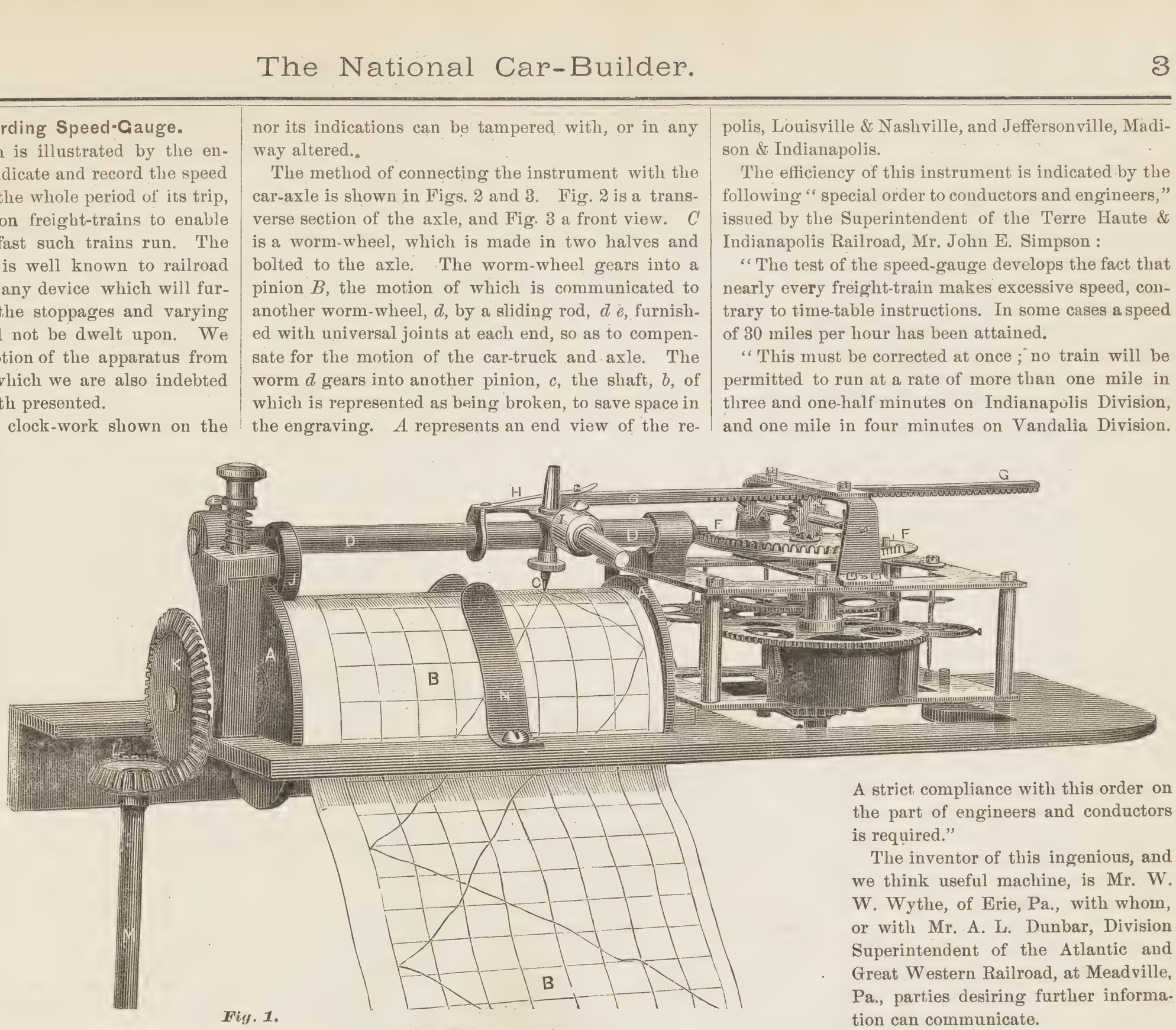


Fig. 1.

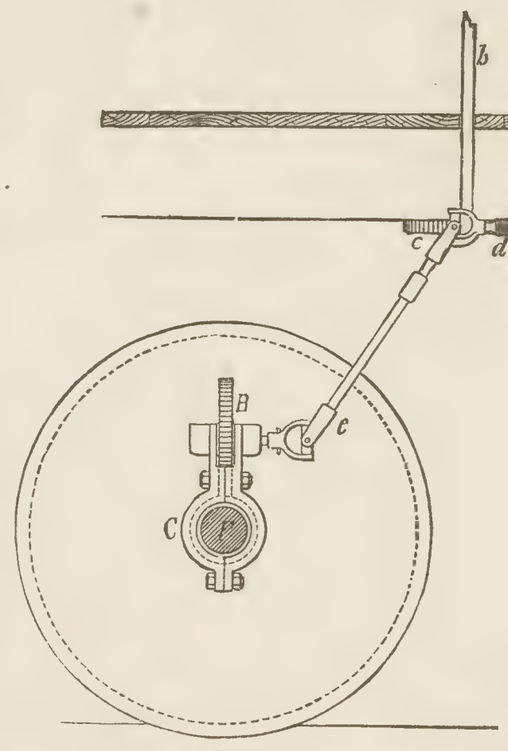


Fig. 2.

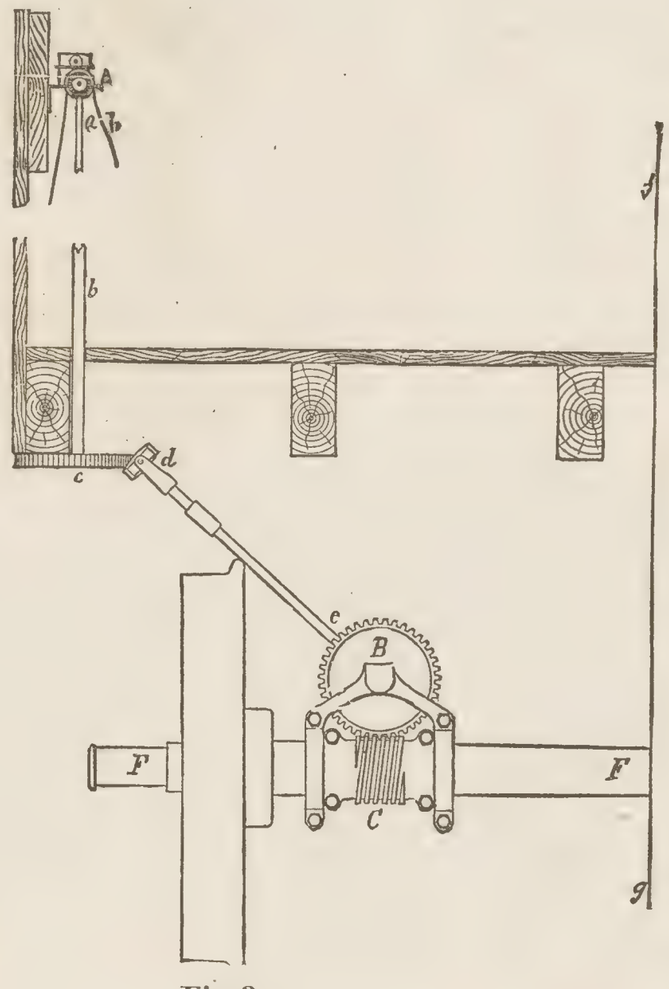


Fig. 3.

The paper is put upon the roller at the commencement of the trip, and remains until the train returns (or longer if desired), as it makes no difference which direction the car is running. The whole apparatus, shown in Fig. 1, is inclosed in a neat box (not shown in the engraving) about 12 inches long and 4 inches high, and is locked up, so that neither the instrument nor its indications can be tampered with, or in any way altered.

The method of connecting the instrument with the car-axle is shown in Figs. 2 and 3. Fig. 2 is a transverse section of the axle, and Fig. 3 a front view. *C* is a worm-wheel, which is made in two halves and bolted to the axle. The worm-wheel gears into a pinion *B*, the motion of which is communicated to another worm-wheel, *d*, by a sliding rod, *d e*, furnished with universal joints at each end, so as to compensate for the motion of the car-truck and axle. The worm *d* gears into another pinion, *c*, the shaft, *b*, of which is represented as being broken, to save space in the engraving. *A* represents an end view of the recording instrument, but on a much smaller scale than in Fig. 1. The portion of the shaft indicated by the letter *M* in Fig. 1 is indicated by *a* in Fig. 3. The worm-wheel on the axle is covered, so as to exclude the dust, and is always liberally supplied with oil.

The two worm-wheels cause a very slow movement to be imparted to the roller *A A*, Fig. 1, that is, one revolution of the roller to 10,000 of the axle, and as the speed is reduced so much the lost motion of the gearing is not perceptible in the diagram, and yet if a train is backed half a train-length, it is readily perceived on the diagram.

This apparatus has been practically tested on a number of Western railroads, among which are the Atlantic & Great Western, Terre Haute & Indianapolis, Louisville & Nashville, and Jeffersonville, Madison & Indianapolis.

The efficiency of this instrument is indicated by the following "special order to conductors and engineers," issued by the Superintendent of the Terre Haute & Indianapolis Railroad, Mr. John E. Simpson:

"The test of the speed-gauge develops the fact that nearly every freight-train makes excessive speed, contrary to time-table instructions. In some cases a speed of 30 miles per hour has been attained.

"This must be corrected at once; no train will be permitted to run at a rate of more than one mile in three and one-half minutes on Indianapolis Division, and one mile in four minutes on Vandalia Division. A strict compliance with this order on the part of engineers and conductors is required."

The inventor of this ingenious, and we think useful machine, is Mr. W. W. Wythe, of Erie, Pa., with whom, or with Mr. A. L. Dunbar, Division Superintendent of the Atlantic and Great Western Railroad, at Meadville, Pa., parties desiring further information can communicate.

A NEW alloy for bearings, known as the Graupen anti-friction metal, is now largely used in Germany. The manufacturers say it is applicable to all purposes for which anti-friction metals have been employed, and it stands alike the test of great pressure and high velocity. They also state that numerous heavy and quickly revolving journals, mounted with this metal, have been worked for some considerable time past in industrial establishments without showing any perceptible wear; and certainly the testimonials which they present from those who have employed it in Germany and Austria would tend to bear out their assertions. Where the best descriptions of bearings stand the wear and tear a short time only, this metal shows scarcely any alteration. It can be adapted in the usual manner to all ordinary bearings, and owing to its being easily fused—the melting point being low—it can be run round the journal in a melted state, which renders it peculiarly adaptable to heavy machinery. The metal has been used in Prussia and Austria on the axles of good wagons, and not a single one of the wagons has got heated or shows any wear and tear, although they have run regularly all this year. The Teplitz Railway Company are using it for fitting locomotive eccentrics, and it is also being employed in rolling-mills. On the Upper Silesian Railway, four wagons have run about 10,000 miles without showing any defect.

THE Woodruff Sleeping and Parlor Coach Company announces a quarterly dividend of two and one-half per cent, payable January 1st.

The Union Pacific Railroad.

Mr. J. C. S. Harrison, of Indianapolis, Ind., one of the Government directors of this road, attended the late meeting of the directors in Boston, and is reported as saying that the road-bed for hundreds of miles has been raised from two to five feet, banks have been widened and cuts taken out, thus relieving the company of heavy expense for snow fences and sheds, and necessitating the retention of but a limited length of snow fences, besides relieving the road from snow blockades. Over half a million has been spent in this work alone, and as much more in filling trestles and replacing bridges with masonry. Another half million of money has been expended in station buildings, and over a million dollars in ties, to say nothing of immense sums expended on shops and fixtures, reducing grades and many other items, which will increase the earning capacity of the road and its permanent value. Two million ties have been replaced since 1869. Extensive rolling-mills have been erected at Laramie, where the company will roll its own rails, using coal mined on its own land. It is now relaying 70 miles of iron each year, replacing chair-joints with fish-plates, and making many other improvements of a like nature.

The road has now 160 locomotives, 56 coaches, and about three thousand traffic cars of all descriptions. The company has facilities for repairing all these in its own shops, and from this it would appear in a condition to be economically operated, as well as to transact its large and increasing business. Mr. Harrison stated that the management of the road was first class in every respect, and fully up to the views of himself and his brother directors. There had been a good deal of howling in regard to roads built with the aid of Government subsidies, and in reference to adverse and shortsighted criticisms he said that in case the road never repaid the United States a cent the people were still gainers; that the saving in the transportation of army stores, mails, and similar items alone repaid the nation, to say nothing of the immense resources of the great scope of country which were being rendered available by the Union Pacific. The mineral and agricultural wealth which the road has as good as created, and the many thousand people to whom the road either directly or indirectly furnishes employment, alone add enough to the taxable assets of the country to bear the interest which the Government has wisely agreed to advance.

High Speed on Railways.

The modern locomotive stands to-day the best exponent of mechanical power and durability we have any knowledge of; but the world wants a better servant, and must finally obtain it. The public are constantly urging managers to make better time, and the managers are endeavoring to satisfy the demand; but they have only succeeded in ascertaining that while it is possible to run trains a mile in a minute, the expense of maintaining such trains is an insuperable obstacle to their use. The wear and tear of rolling-stock, and the injury to the permanent way; the expenses in keeping up road-bed, embankments, bridges, and the cost of equipment, are enormously increased by high velocities. The mechanical difficulties are not insurmountable. Engines can be made to turn their wheels as fast as any one wishes to ride, but until we can build a bed and equip it with a rail that will annihilate the effects of heavy blows from heavy bodies at a high velocity—until we can overcome the existence of live force and neutralize its effects, we may relinquish the hope of a remunerative traffic at high speed. Trains have been run for long distances in this country at high velocities, only to demonstrate the views above set forth. Locomotives have been built with enormous driving-wheels, 6 and 7 feet in diameter, and driven as fast as the pistons could propel them, but they have all been discontinued, and the regular rate of 25 or 30 miles an hour is maintained as the highest profitable. What engineers have done to overcome space rapidly is to render the locomotive capable of making long runs without requiring to stop for fuel or water. If it can not run at a high velocity without destroying itself, it can keep running at one comparatively low, and accomplish good results.

It is possible to leave New-York at 10 A.M. and reach Buffalo at 10.20 P.M., which is not a small achievement. Yet even this is unsatisfactory to the people at large. It may be urged that trains abroad are run rapidly, at much higher speed, but this is true in a few instances only. The climate of England, however, permits of a much more stable roadway than our own; it is more easily kept in alignment, and stock runs with less injury upon it. Frosts do not strike three or four feet deep there as in this country, and stockholders lay out more money in cost per mile than American stockholders care to. But though some trains do run at 50 miles per hour, it is said in a recent report that they are not profitable; the same causes work against them there as here. The most remunerative trains are those which run at the lowest speed. The existing locomotive can accomplish no more than it has done. It may admit of various refinements in mechanism, improvements in itself, and additions to its capacity; but so long as its enormous weight continues, so long as its power depends upon its weight for its very existence, just so long it will destroy as it moves, if driven beyond certain velocities ascertained to be profitable.

The locomotive of the future and the railway-train of the future, to achieve high velocities, will have to be of different construction and character. Master mechanics and car-builders are racking their brains to reduce weight and retain strength and stiffness in cars and engines, but beyond a certain point they are unable to get, and they will always be met by the same obstacles while the conditions remain unchanged. We must have lighter motors of increased force; lighter cars with greater strength; more solid roadways without curves, high embankments, long spanned bridges, or deep cuttings. When all these conditions are obtained, we may fly over the earth's surface a mile or two in a minute as easily as birds traverse the air.—*New-York Sun.*

Springs for Propelling Street-Cars.

A recent number of *Iron* contains the following description of a plan of propelling street-cars by means of springs:

The winding-up of the spring-barrels, which are carried under the car, is effected by engine-power, located at suitable intervals along the track, as may be convenient for the run. The stationary engine drives by belt the horizontal shaft, carried in bearings, inclosed in a metallic tube or casing, beneath the roadway, and extending across the track; close alongside where of a covered box is sunk in the roadway, inclosing a wheel, so shaped as to connect with the winding axle of the tramway car, and thus give the requisite motion thereto. On the arrival of a car at any station, the spring-barrels are quickly wound up by the engine.

It has been computed that the actual tractive force requisite to overcome the resistance of a street-car weighing gross 5 tons is 60 lbs. on the driving-wheels, corresponding to 720 lbs. on the periphery of the spring-barrel; 24 lbs. and 288 lbs. respectively correspond to a gross weight of 2 tons; and in like proportions for intermediate weights. So far as previous experience goes, a spring 6 lbs. in weight, exerting a direct pressure of 105 lbs., may be taken to represent the maximum in size and power of such steel springs. Under the stimulus applied by M. Leveaux's researches, the steel manufacturers of Sheffield, by special and improved plant, annealing ovens, and appliances, have turned out springs 50 to 60 feet long, capable when duly coiled of exerting a pressure of 800 lbs. to 900 lbs., without permanent set. In France, also, steel driving-bands, with great elasticity, are made, 100 yards in length, so that the question of the possibility of obtaining springs of the requisite size and power is practically solved.

M. Leveaux has had all the necessary mechanism and appliances made by a well-known firm of engineers, so as to fit up a tramway car or cars for actual trial upon some of the lines of metropolitan tram ways in London; for which, indeed, the arrangements are now nearly complete, so that the practical working of the system will speedily receive a thorough public demonstration. We have ourselves had opportunities of seeing the potentialities of the principle, both in the model and full working size; and even in view of the sweeping change in the tramway system which is involved in its complete success and adoption, we can not withhold the conviction that all the important practical difficulties have been effectually surmounted, reducing its practical realization to mere matters of detail. The working of the springs is entirely free from noise, perfectly smooth, easy, and effective, and completely under control, for application, cessation, and reversal.

Pennsylvania Railroad Regulations.

Among the new rules recently adopted are the following excellent ones which the public will appreciate:

"Brakemen must announce the name of each station, and the length of stop when it exceeds two minutes. Baggage-masters are prohibited from receiving perquisites for the care of articles. The order will go in operation as soon as possible. Newsboys on trains will not be permitted to individually importune or annoy passengers, but may announce in a low voice, or at intervals not exceeding four times in each car, the articles offered for sale. Nor will they be permitted to deposit their papers, books, etc., on the seats of the cars or in the laps of the passengers. Depot masters and assistants, passenger conductors, and brakemen and baggage-masters must wear suitable badges. Conductors must seat passengers, and see to their comfort and enjoyment as much as possible, see that none stand on the platforms, or ride on baggage, mail, or express cars, put off passengers refusing to pay at next station; nor permit drunken or disorderly persons on trains, nor allow profanity. Baggage agents and masters must handle baggage carefully; the former to charge for extra weight invariably; the latter to carry only such packages, bundles, moneys, etc., as the Division Superintendent authorizes. No tickets must be sold to persons so intoxicated as to be incapable of taking care of themselves, or who, by reason of such condition, might risk their lives by traveling, nor to any one incapable of self-care. Loungers are not permitted in telegraph-offices. United States mail agents, express managers, sleeping-car conductors, porters, news-agents, and individuals running private cars are to be regarded and to consider themselves as employees, and to conform to these rules and regulations."

An Early Opinion of Railroads.

An old copy of the English *Quarterly Review* of the year 1819 contains an account of a scheme for a railroad, on which it is proposed to make carriages run twice as fast as stage-coaches. The editor evidently failed to appreciate the idea, or to believe in its possibility, for he comments upon it thus wise:

"We are not partisans of the fantastic projects relative to established institutions, and we can not but laugh at an idea so impracticable as that of a road of iron upon which travel may be conducted by steam. Can any thing be more utterly absurd or more laughable than a steam-propelled wagon moving twice as fast as our mail-coaches? It is much more possible to travel from Woolwich to the arsenal by the aid of a Congreve rocket."

J. H. Devereux has been appointed receiver of the Atlantic and Great Western Railroad at the suit of the mortgage trustees.

Stone's Double Automatic Car-Coupler.

THE announcement of a new car-coupler in these days is not calculated to throw railroad men into a paroxysm of excited curiosity, but we are nevertheless constrained to say that the one which we now illustrate and describe is entitled to a respectful and candid consideration on the score of its intrinsic merits.

Fig. 1 represents a top view as it appears with the platform-floor of the car removed; and Fig. 2 a side view as it appears between the draw-timbers. The main features of the device, as will be seen, are a hook and jointed toggle, one of each being attached to each end of the car. In coupling, the toggle drops down and engages with the hook, the latter striking upon an apron underneath and sliding upward until caught by the toggle, but is prevented from going too far by the contact or meeting of the buffers. The draw-timbers are very deep, and are boxed out so as to come well up upon the end-sill. Near the front end they are mortised to receive the draw-springs, which also serve for buffer-springs. In Fig. 2 are shown the lines of the drawing and buffing strains, both of which are so high as to be above the bottom of the end-sills and on a line with the side sills. When it is desired to uncouple, a lever, shown in both drawings, raises the toggle and disengages the hook. The shaft to which the hook is attached is a piece of unfinished 2-inch round iron, drilled at the ends to receive the split pins, which prevent it from slipping out of place. The toggle consists of two pieces of cast-iron connected by a round iron pin, and is hung upon another piece of round iron drilled for the split pins as above, to hold it in place. Both these pieces go through the draw-timbers as shown. The apron, shown in Fig. 2, is made of thin boiler-iron bent to shape upon a former. The ends of the timbers are strapped with flat bar-iron. The buffers are the revolving pattern, and bear upon the draw-springs, making them do double duty as in the ordinary draw-bar. The arrangement of the buffers in connection with the draw-springs is such that the cars can be coupled under compression. The hook-shaft bears upon the inner end of the springs. In coupling with the common draw-head, the buffers, which are 24 inches from centre to centre, strike upon the buffer-blocks or dead-woods, leaving sufficient space for a man to stand and place the link in the draw-head after the cars are in contact. The link is attached to the main hook by a small hook at its back end.

One advantage of this plan consists in the fact that it is a *double* coupler, one hook and toggle being sufficient for coupling the cars and drawing the train in case the other should give way. Its rapidity of action is such that a train may be coupled as fast as the cars can be brought together, and without any attention from the brakemen, the operation being entirely automatic. Another advantage is that a train may be uncoupled under a drawing strain, a thing very desirable in various emergencies which are liable to occur, and which would be impossible with the ordinary draw-head. By means of a cord from the cab to the back of the tender, the engineer can instantly disconnect the tender from the rest of the train. The strains of drawing and buffing, as we have said, are brought into line with the side-sills, an advantage which every railroad man will appreciate. The full strength of the sills is rendered available to resist shocks, and delays incident to the pulling out or disabling of the ordinary draw-heads are avoided. The employment of two springs instead of one gives an easier motion, and diminishes the force of the shocks in stopping and starting. Uncoupling is done from either side of a train, and there is no need of going between the cars; it can also be done from the roof if required. By a simple modification of the end of the hooks, cars may be uncoupled when off the track, or at any angle from a perpendicular. The direct line of resistance also tends to prevent telescoping. The use of links and pins being dispensed with, the expense incident to their loss is avoided.

The cost of the hooks is about $7 a pair, the buffers $2.50, aprons $2.50, and toggles $2.70. The cost of applying the coupler to old or new passenger coaches is about $100 each. It has been in use upon the milk-trains of the Erie Railway about six months, where they have been subjected to the severest tests, and have been shown to have a large margin of strength over the common draw-head. Much time is saved in switching and making up trains, and none has been lost by any derangement of the apparatus. The inventor, Mr. Eaton Stone, may be addressed for further particulars at the Car-Builders' Association Rooms, 113 Liberty street, New-York, where models and detailed drawings may be seen.

FIG. 1.

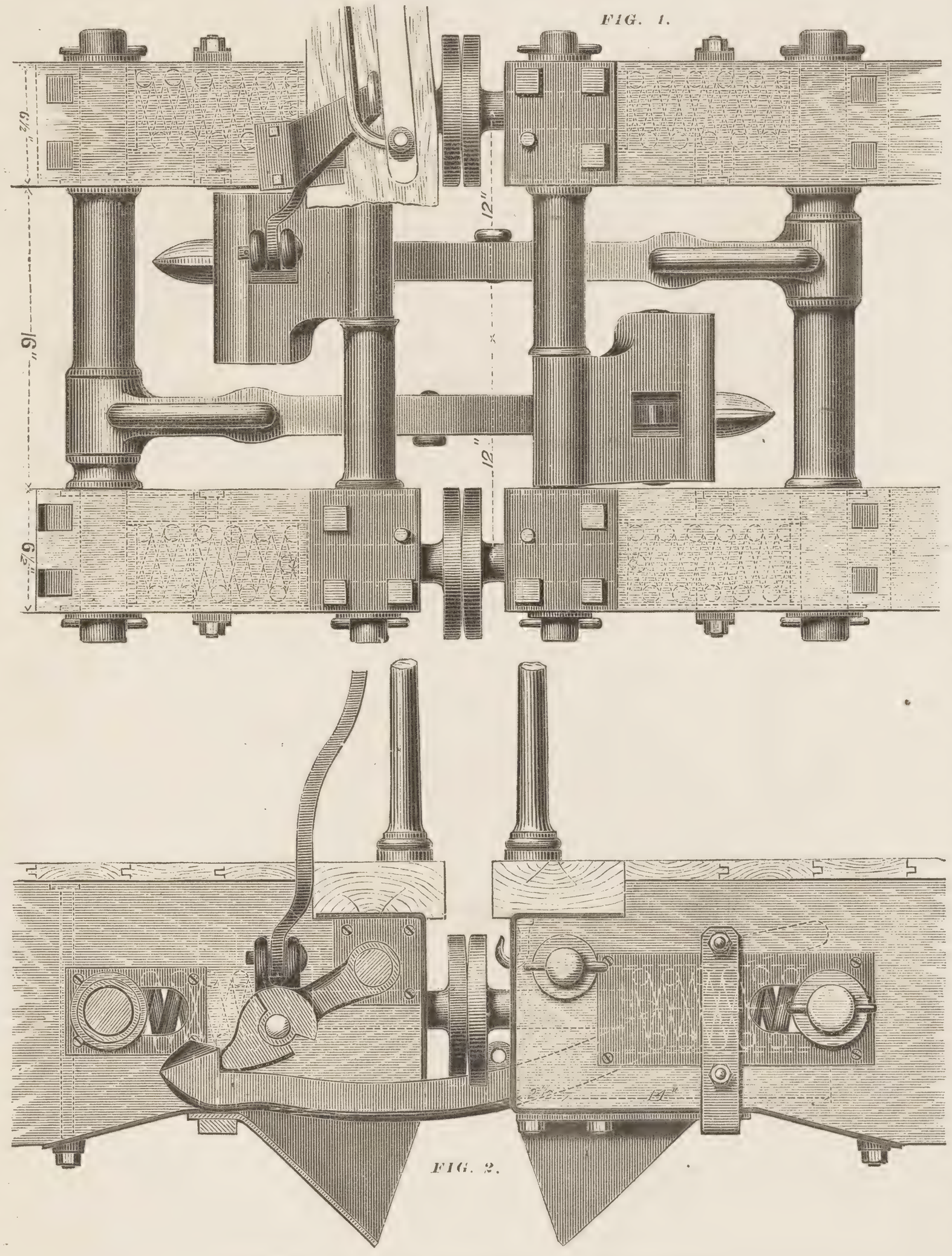


FIG. 2.

STONE'S DOUBLE AUTOMATIC CAR-COUPLER.

A CITIZEN of Cincinnati has put upon the streets of that town a vehicle designed to supersede street-cars. It is about the size of a common street-car, and will seat sixteen passengers. The wheels are similar to those on carriages, but the axle is curved in such a manner as to allow the floor of the car to be on a level with the pavement. The driver sits in front, and uses an ordinary foot-brake in place of those common to street-cars. The entrance for the passengers is peculiar. The steps are parallel with the side of the car, but the doorways, one on each side, are placed diagonally across the end. This arrangement is made to allow passengers to step directly into the car from the sidewalk. It is said that these cars cost less than others in use, require no track to be laid down, and, owing to the double action of the wheels, run as lightly and easily as buggies of modern improved patterns and constructions. These cars or vehicles may take the place of omnibuses. No doubt they will, if properly introduced, but they will not supersede passenger railway-cars.

THE Ontario Car Company, of London, Ont., have recently added to their works a department with all the necessary facilities for the construction of passenger-cars. A number of coaches have already been turned out for the Toronto, Grey and Bruce, and the St. Lawrence and Ottawa Railroads, which are satisfactory to the roads and creditable to the builders.

A MRS. FITZGERALD, who is said to be a woman of much executive ability and enterprise, recently completed a contract for grading 19 miles of the Galveston, Harrisburgh and San Antonio road in Texas, and has secured another contract on the same road. She owns 60 mules and a full outfit of scrapers, plows, etc., and works a large force of men.

The Lubrication of Railway Rolling-Stock.

To the Editor of the National Car-Builder:

DEAR SIR: The article by Mr. Blanchard on the subject of lubrication, which appeared in your November number, and the comments thereon by "C. S.," in your last issue, indicate that a lively interest still exists in this much debated subject. It is one of the perplexing problems of railroad economy, and the more it is discussed the sooner will something like a satisfactory conclusion be arrived at. In what I shall say, I intend no reflection upon railroad managers, many of whom give to the subject a great deal of earnest and careful consideration. I merely desire to contribute my mite to the general fund of information, and mainly with reference to the value of the test-tables which form a part of the communication of your correspondent "C. S.;" and I will say, in passing, that I do not understand Mr. Blanchard as recommending the Pennsylvania earth-oils as lubricants, but only as showing by analysis that they contain substances that are not lubricants.

The experiments made by Mr. Van Cleve, as shown in the published tables, may have been very satisfactory to those who witnessed them, and could observe the many minor details not given in the report; but, to an outsider, there is a lack of sufficient data to enable him to make an intelligent selection from the various oils named. The standard for comparison appears to have been "Flanders' Winter Sperm," of the performance of which no statement is furnished, and consequently no intelligent deduction can be made in regard to the qualities of the other oils. The conditions of pressure seem to have taken a wide range; but, in order to determine the comparative merits of the various lubricants for railway purposes, the pressure applied should have been uniform; also, the length of time each kind was under test, and the rise of temperature in the machine during such time. One of the indispensable requisites of a good railway lubricator is that it shall be adapted not only to a heavy pressure under rolling friction, as in the case of driving-axles, but also for the lighter pressure of links, rockers, and eccentrics, and the sliding friction and quick motion of guide-bars. This is the more important when engineers will not take the trouble to apply each lubricator, when more than one kind is used, to its proper place, or where it will give the best results. As a general rule, that kind which keeps the engine and tender-truck axles and main connection-rod bearings cool, will be found best for other parts of the engine, or for any kind of heavy, quick-moving machinery. The tables of Mr. Van Cleve give only a medium pressure for engine-oils, and a speed of 130 revolutions per minute, while the driver-journals of an 8-wheeled freight locomotive sustain a pressure of nearly 10,000 lbs. in most cases, and the speed as above is equivalent to about 24 miles an hour for a 5-foot driver. The revolutions reported for car-axle journals are equal to a speed of 20 miles per hour for a 33-inch wheel, and the pressures of 4000 lbs. per journal are about that of the car in its ordinary condition; but when it is overloaded, and run at a speed of thirty miles an hour, the result would be different; and it is in such a contingency that we need a lubricator to do its duty, and save loss of time in overhauling a hot box.

The views of your correspondent "C. S.," in regard to the expediency of establishing an oil-bureau to test the quality of oils in the market, coincide with my own. I think with him that the best way to determine their value as lubricants is for each master-mechanic and car builder to rig up a reliable apparatus and test for themselves. One great source or cause of poor lubrication may be traced to a sympathy which frequently exists between employees and contractors, and which prevents a fair report as to what a lubricator can do when furnished in bulk, as compared with what is indicated by a special test or testimonial. As an illustration, we will refer to an incident which occurred within our personal knowledge. An important railway company was induced to purchase its oil from a "curbstone dealer," who had been mainly instrumental in organizing "The Great Skylark and Liberal Policy Oil Company," but who never had a half-dozen barrels in stock at any one time. The process of manufacture consisted in taking the oil from the wholesale dealer's to a small back cellar, starting the bungs, and taking from six to nine gallons from each barrel of No. 1, and replacing it with a like quantity of No. 2 or a worse quality, painting the heads, and branding them with the initials of the company aforesaid. The oil suited to a charm, and nothing but laudatory reports were made by the engineers, until at length a new superintendent took the reins. The oil bills seemed to him rather heavy; so he purchased from a wholesale dealer a dozen barrels of prime No. 1, put it into the empty barrels of the Skylark Company, and filled the wholesale dealer's barrels with the Skylark oil, sending both lots to the railway oil-house. The reports from the engine-runners, which followed, indorsed what they supposed to be the Skylark oil as surpassing in excellence any that had ever been used on the road, while the wholesale dealer's samples were too poor to cut bolts or grease switches with!

The reports of oil tests made by master-mechanics and car-builders, as above suggested, if properly compiled and tabulated, would be exceedingly serviceable to railroads. They should embrace every essential particular, the size of journals, material of bearings, pressures, revolutions per minute, temperature at beginning and end of experiment, the time occupied, amount of lubricator consumed, and especially the nature of the residuum, the power required to drive the tester, the state of the journals after testing, whether cut or smooth, gummed or clean, and the reduction in weight of bearing and journal. Each test should be continuous, and not subject to interruption.

If one lubricator will keep the journals and wrist-pins to which it may be applied clear, clean, and free from cut, and another leaves the journals in such condition as to need turning, and the wrist-pins to be knocked out and new ones put in every time the engine is in for light repairs, the actual cost of the first lubricator as compared with the other is of little importance. Whatever the excess may be is a good investment, and in the line of true railroad economy. The quantity of metal annually ground away by the use of mineral oils pumped out of the third sand-rock, with their admixtures of grit and tar, is in the aggregate so enormous that any remedy which will abate the evil is greatly to be desired.

ONTARIO.

The Dimensions of Freight-Cars.

To the Editor of the National Car-Builder:

DEAR SIR: A great deal has been said and written about the importance of reducing the dead weight of railway rolling-stock, so as to lessen the cost of transportation. It is certainly very desirable that every pound of superfluous weight should be got rid of; but it is at the same time equally important that a right discrimination should be made between what is really superfluous and what is not, and that what is inherent and indispensable should be utilized to the utmost. The length, width, and cubic capacity of a car may be such as to carry to the best advantage a certain class of freight, while it is but poorly adapted to many other kinds of a different bulk and weight, the consequence being that at times it has to run empty or with but a fraction of a load, when, by means of a slightly modified construction, the evil might be to a very considerable extent avoided. The question is, whether the advantages to be derived from a lighter construction can not be secured by making such changes in dimensions, etc., as will render a car more available for all the requirements of traffic, and more capable of being worked continuously to the limit of its capacity. I am not going to propose any startling innovation or revolutionary scheme, but simply to offer some suggestions, supported by facts and figures, of the value of which the reader can judge for himself.

The inside dimensions of an ordinary standard-gauge box-car are 27 ft. 5 in. long, 7 ft. 5 in. wide, and 6 ft. high, the floor area being 203 square feet, and the cubic contents 1220 feet. The inside dimensions of an Erie Railway 6-foot gauge box-car are 28 ft. 7 in. long, 8 ft. 1 in. wide, and 6 ft. 6 in. high. Assuming the height to be the same as that of the standard-gauge car (6 ft.), the cubic contents will be 1386 feet, and the floor area 231 feet. Here we have for the small increase of 14 inches in length and 8 inches in width, a gain of 28 feet in floor area and 166 feet in cubic content, or one seventh of the floor area and contents of the ordinary car, with a proportionately better space for the advantageous stowage of freight and the accommodation of articles of bulk. The increased length and width involves, of course, additional weight; but this is inconsiderable when compared with the increased capacity which we get along with it. It is pretty generally conceded by car-builders that the weight of trucks and floor-framing can not be safely reduced below what it now is without a sacrifice of needed strength; indeed, a heavier axle instead of a lighter one is being adopted, and there seems to be little chance of saving any thing in operating expenses by diminishing the proportion of dead to paying weight. It is quite clear that the present weight must be retained. To persist in reducing it by paring down sills, rods, and posts, is merely sacrificing live strength to get rid of what is often miscalled dead weight. The true remedy, so far as the case is remediable, would seem to be a change in the dimensions of cars by giving them greater length and width, enabling them to carry a greater weight per wheel of bulky freight, or of sundry kinds of long freight which would otherwise be excluded. Let car-builders get their ideas adjusted to a 32 or even a 34-foot-sill, with short doors or end-openings in the car-body above the grain sheeting, to take in 30-foot rails or long lumber, instead of hauling cars over the track empty.

As an illustration of the advantage of having box-cars of this length, an incident may be related which occurred on the line of a Western road a year or so ago. A rolling-mill had turned out 5000 tons of rails which were lying alongside the track ready for shipment. The stock and gondola coal-cars of the line were at the time fully occupied with their legitimate work, while hundreds of empty box-cars were daily passing toward the points where the rails were needed; but being only from 25 to 27 feet long inside, and with no end-doors so the rails could be got in even if the cars had been long enough, the rails had to lie where they were until spring, and were then shipped on stock and gondola cars. A like trouble often occurs with respect to lumber and other kinds of freight that might be named. Hundreds of box-cars daily move over our roads with but a fraction of the load they are capable of carrying, merely because they are too short or too narrow to receive certain kinds of freight.

We can readily anticipate the objections to placing broad-gauge car-bodies upon standard-gauge trucks. The impression is very general among car-builders and railroad managers that the increased width would produce a rolling, oscillating side-motion, injurious to both cars and track; but in order to quiet any fears of this kind, I would appeal to the experience of roads that have changed from a 6 or 5 foot gauge to 4 ft. 8½, without narrowing their car-bodies, and ask if their old wide cars do not run as well, and with as little motion, on the new trucks as on the old ones? Or, if there is any increased rocking or unsteadiness, whether it is not easily remedied by a proper arrangement of centre-plates, springs, and truck-frame? The writer knows of at least one road which uses on its ordinary box-cars broad centre-plates, 18 inches or more in diameter, but without side-bearings, and no

very dangerous proclivity of the cars to roll off their trucks has yet been reported ; and if cars 8 feet in width will ride steadily on so narrow a base as 18 inches, we think 6 inches more may be added to their width without deranging the centre of gravity or interfering with the double-shuffle of a frolicsome brakeman on the roof. Having adopted a stronger and heavier axle, with rightly proportioned journals and wheel-fits, with truck-frame and wheels to correspond, let us give them *something to do* by placing upon them a car-body that can carry 15 tons of freight, year in and year out, without premature signs of breaking down. Even if loaded to a maximum capacity of 3 tons per wheel, it would not exceed the weight upon the wheels of passenger-cars and locomotive tenders and trucks, which make a far greater mileage. The concentration of the loads of three ordinary cars into two, would be a great advantage to both carriers and shippers in many ways, which need not be enumerated, but which will readily occur to those familiar with railway transportation.

The defects referred to in the construction and dimensions of freight-cars are not properly attributable to car-builders, but are the result of a general inattention on the part of railway men to the actual requirements of traffic, and the changes in its character and growth. The eagerness for cheap cars, stimulated by the rivalries between roads and among car-builders, has caused almost any thing to be accepted as a car that had wheels under it, and not a wagon or a buggy. Whether it was of a length, width, and strength to accommodate general traffic to the best advantage, was a secondary matter, which would naturally take care of itself. If it would hold and carry 10 tons of pig-iron, or the same weight of merchant's iron in 12-foot bars, it would, from a parity of reasoning, hold and carry 100 barrels of flour or pork, 10 tons of feathers or wool, or a like tonnage of agricultural implements. W. P. M.

In car-building nickel-plated screws are rapidly coming into general use. This grows out of the fact that though their original cost may be a trifle more than silver-plated screws, yet as nickel does not oxidize by exposure to air, the excess of cost is more than made up in the durability of the plating. Hence, in nearly all of the large car manufactories, nickel-plated screws are superseding silver-plated for use in joinery work. Just why house-builders have been slow to practically recognize their superiority we are at a loss to conceive, unless, indeed, they cling to the "penny wise and pound foolish policy" of making a trifling saving in original cost at the expense of an ultimately greater loss in durability. There is, however, a gradual but steady increase in the use of nickel-plated screws in house-joinery, which argues well for their final adoption for all such work in which silver-plated screws are now employed.

The Lake Shore Railroad has had under construction for some time, and has just completed, at their car-works in Adrian, a postal-car of a new pattern, intended especially for newspaper work. It has already been put upon the route between Chicago and Buffalo. The car has been built partially as an experiment, and partially from a knowledge of what the service demands. It is 60 feet and 6 inches in length, and weighs 49,300 pounds. It contains 122 distributing boxes in the centre of the car, while the ends are arranged for the convenient storing away of the filled sacks. Besides these, the car is fitted up with all the modern conveniences for the rapid and easy disposition of the work. There is room for two men to work ; and it is expected that with the convenience afforded they can conduct newspaper distribution as expeditiously as that of letters. The orders are out for two similar cars, but work will not be prosecuted upon them until this one is fairly tested, to see if any improvements can be made.

The Ventilation of Passenger-Cars.

We illustrate herewith a plan for the ventilation of passenger-cars, of which Mr. James M. Palmer, of Portland, Maine, is the inventor and patentee. It is adapted to both summer and winter ventilation, and provides for exhausting the impure or vitiated air from the bottom of the car instead of the top, a method which is getting to be recognized as the correct one in its application not only to railway-cars, but public halls, churches, and apartments of every description. The cuts represent two cross-sections of a car, Fig. 1 showing the plan as designed for summer, and Fig. 2 for winter ventilation. The *modus operandi* is so clearly exhibited that it is almost unnecessary to go into any detailed explanation for the information of car-builders, whose attention has of late been very generally attracted to the subject. We will say, however, with respect to winter ventilation, that the plan is applicable to cars with a stove or other heating apparatus at each end, the stoves to be inclosed in a sheet-iron or other metallic covering, with a suitable space intervening for the passage of a sufficient volume of air for the needs of passengers. The supply is introduced into this space at the bottom through an opening in the car side, and by means of diaphragms is conducted backward and forward

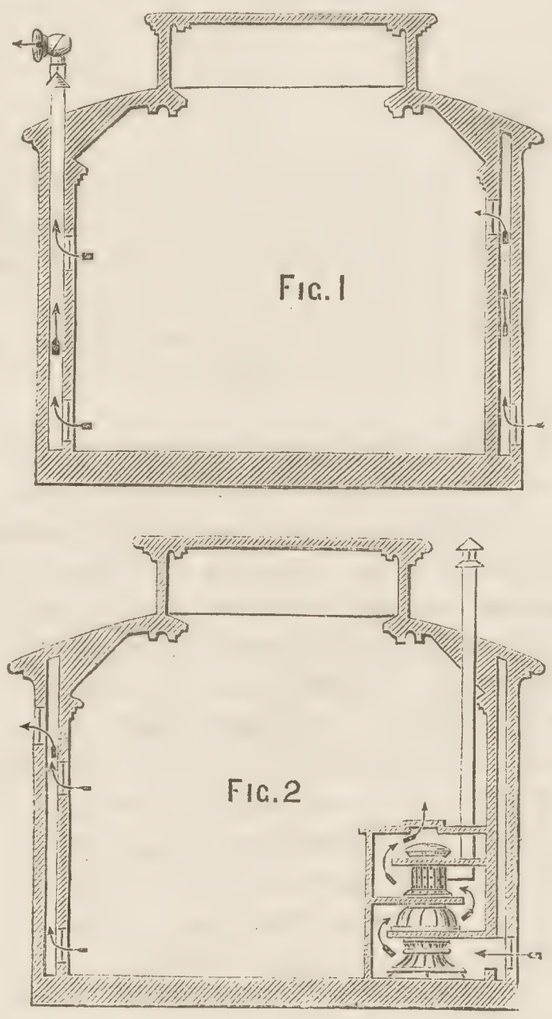


Fig. 1

Fig. 2

about the stove until it is well warmed, when it is discharged into the car through a register at the top of the stove-covering. To make room for this influx by expelling or exhausting the cold and vitiated air, openings are provided along the car sides next the floor, and communicating with vertical flues in the side-walls between the windows. These flues may terminate in openings in the side of the car under the eaves, or in cowled pipes or chimneys above the roof. The supply and exhaust being thus provided for, the quantity is regulated by means of registers over the stoves and at the exhaust openings. These latter may, if desired, be at the end of the seats, next the aisle, with ducts passing from thence under the seats to the car wall. Registers may also be placed in the wall above the heads of passengers to relieve the car when overcrowded or excessively heated, as will sometimes be the case in spite of the best devised plans and regulations.

The advantages of this plan for securing ventilation in winter, as well as a uniform distribution of warmth throughout the car, will be obvious to every one who has given the subject any attention. Warmed air is constantly introduced, and there being no outlet for its escape at the top, it necessarily forces the colder air out at the bottom, together with the carbonic-acid gas exhaled from the lungs, which, by its specific gravity, falls to the floor as soon as it acquires the temperature of the surrounding air ; and especially in crowded railway cars, where it is generated in large quantity in proportion to the space occupied. The plan, in a word, secures a circulation, and the passengers are exposed to no direct currents of either cold or warmed air. The car is ventilated, in fact, without the knowledge of the occupants.

What has been said above has reference chiefly to the conditions of winter traveling. The only modification for summer is to introduce registered supply ventilators in the upper part of the car walls in the alternate spaces between the windows, while the exhaust will take place through the alternate openings at the bottom, as indicated by the arrows in the drawings. The supply openings, both for summer and winter, may be covered on the outside by wire gauze or grating.

This method of ventilation has been in use by the inventor for more than six years with the best results. He may be addressed as above.

California Redwoods.

Great inroads have already been made in the forests of the Pacific coast at many points ; especially within easy sailing distance of San Francisco, the available timber has been destroyed. There is, however, an immense belt extending from the Russian River northward. Mills are located at every available point ; and at the present moment in Humboldt Bay, the great lumber port of the redwood belt, even the little creeks and sloughs running into the bay have been cut. Thus logging becomes each year more expensive and difficult. The supply is, however, so extensive, and the opportunities for opening new districts so great when the demand for lumber will justify increased expense, that it is not probable our supply will diminish for many years. There are immense forests of redwood on both the Eel and Mad Rivers, in this section, yet untouched. There is an immense belt also back of Trinidad. Thence northward the redwood becomes scattered until we reach the vicinity of Crescent City. Back of this place, and covering the low land, once evidently overflowed by Pelican Bay on the north and Crescent Bay on the south, is an exceedingly heavy body of this timber. It extends up the flanks of the lower Siskiyou Mountain, which here puts down to the sea, and ceases at an elevation of about 1200 feet above tide. Many of the trees have a diameter at their base of thirteen and fourteen feet, and the average run of saw logs would be from six to eight feet.—*N. W. Lumberman.*

The Montreal Northern Colonization Railway is a new line now under construction from Montreal along the northern side of Ottawa River to about seven miles beyond the city of Ottawa, this being the terminus of the river navigation. There is also a branch, 13 miles long, to the town of St. Jerome. The length of this section of main line is 137 miles, over 100 miles of which are graded, and bridge piers of the most substantial masonry are in readiness for their superstructures. Bids for the construction of this portion of the work during the present winter have been received. The Manchester, N. H., Locomotive Works have contracted with the company to furnish 16 engines, half of which are to be delivered on the 1st of April next. Contracts for freight-cars have been advertised for, and other contracts will be required for passenger-cars in a few weeks. The company are bound, by the forfeiture of municipal and other grants to the amount of $2,500,000, to have the first section in running order by Oct. 1, 1875. Two cargoes of steel rails are in readiness for laying early in the spring, and it is expected that 68 miles of the road will be in operation in June next. The second section of about 170 miles has been located, and it is expected that work will be commenced on 68 miles of it at an early day.

The National Car-Builder

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Editorial Announcements.

CORRESPONDENCE.—*We cordially invite the co-operation of the railroad public in affording us the material for a good mechanical paper. Articles relating to rolling-stock and machinery, by those practically acquainted with those subjects, will be gratefully received. All communications must be addressed to Vose, Dinsmore & Co., No. 32 Warren Street.*

ADVERTISING RATES.—*For one square, or one fifth of a column, $5 per month, or $50 a year. For half a square, $3 per month, or $25 a year. Larger advertisements by special contract.*

All communications in regard to advertising should be addressed to L. F. DINSMORE, *Post-Office Box* 4055, *New-York City, who is our agent for advertising, and authorized to make contracts, collections, etc.*

ENGRAVINGS AND ILLUSTRATIONS.

We would invite the attention of Master Car-Builders and others to the advantages to be derived from publishing in THE NATIONAL CAR-BUILDER *engravings designed to illustrate the various features and details of car construction, and especially such improvements as can not otherwise be clearly presented. We will procure cuts to be made in the best manner from drawings or models that may be sent us, and charge only for the cost of engraving, inserting the same in our paper with suitable descriptive details, without charge.*

A Hopeful Sign.

FROM information which reaches us from various sources it is evident that business in the car-shops is becoming more active, and that the long period of stagnation has reached its turning-point. There are indeed very good reasons for anticipating a marked recovery in this important branch of industry within the next few months. During the year which has passed, the roads have been practicing the utmost economy in every kind of expenditure, and especially in the construction of rolling-stock. Old cars have been repaired and kept in service to the utmost limit of their capacity; and although there has been considerable falling off in general traffic, it has not been commensurate with the almost entire suspension of car-building among the regular manufacturers and in most of the road-shops. With the exception of sundry roads in the North-west within the jurisdiction of Granger laws, there has been no material reduction in the number of trains or train mileage, and the depreciation from ordinary wear and tear has consequently not been diminished. It is not surprising, therefore, that many roads are in want of new cars to replenish their reduced and battered stock and bring their equipment into proper relations with their present and prospective traffic.

According to a fair and reliable estimate, there were built during the year ending June 1, 1873, in the United States and Canada, no less than 59,000 cars of all kinds, and a very large proportion of these were for old roads. This was before the panic, to be sure, when railroad securities found a ready market, but it is fair to assume that the consumption of rolling-stock even then bore some definite relation to the demands of traffic. We have no means of determining with any accuracy how many have been built since the date above named, but the number must be small indeed as compared with what were built during the previous eighteen months. If there is to be no further reduction in the present traffic of the roads, or if, what is more probable, there is to be a very material increase with the anticipated revival of general business, the necessity of immediate additions to the present rolling-stock equipment is apparent. It is this which causes the renewed activity to which we allude, and which, we think, is likely to be much greater before midsummer. Whether a corresponding improvement in other leading industries will take place, is not so clear; but the effect of setting the car-shops to work can not be otherwise than favorable to many branches of trade and manufacture.

Rapid Transit.

ALTHOUGH the interest in what is known as the rapid transit problem is chiefly confined to the length and breadth of Manhattan Island, there are vast numbers of people beyond these limits, and especially in the densely populated suburbs lying adjacent, who are more or less concerned in an early and practical solution of the question. To such it may be of some interest to know that a committee of the American Society of Civil Engineers has for some time past been hard at work collecting information, examining plans, and hearing opinions on the subject, for the purpose of making a report that shall indicate, from a professional and engineering point of view, what are the most feasible methods of construction. Such a report, if sufficient time and labor are bestowed upon it, must be exceedingly valuable, and assist very much in eliminating from the multitude of schemes and projects whatever is crude and impracticable. The opinions of the committee, as we gather from an editorial article in the *Railroad Gazette*, are to the effect than any thing like rapid transit between the upper and lower portions of the city can only be secured by roads either above or below the surface of the streets—either by an underground tunnel or depressed open cuts, or by road-tracks elevated above the surface. The cost of these different methods and their respective capacities as paying investments are being investigated in a way to insure results that will be approximately correct, and serve as a basis for actual operations. That such operations will begin before a great while, there can scarcely be a doubt, in view of the inadequate and unsatisfactory nature of the present means of city transit. A hard winter with a succession of heavy snow-storms would aggravate the present discontent to the point of culmination.

Genuine vs. Counterfeit.

AN increasing disposition has been manifested of late by parties engaged in the manufacture of certain kinds of supply material for railway consumption, to disregard the rights of patentees and impair the established reputation of standard products by putting upon the market articles of inferior quality to meet the prevailing demand for lower prices—a demand which naturally grows by what it feeds on. The tendency in this direction is essentially a demoralizing one. Individual rights are invaded, business confidence is shaken, and so far as inferior products are introduced into the category of supplies, the safety of railway operation is endangered and wasteful expenditure in the deceptive guise of economy is the unavoidable result.

As an illustration of this growing evil, we may instance the well-known Dinsmore Spring, the rightful makers of which have always kept it up to its original standard of excellence as respects material and quality, well knowing that neither makers nor users can afford to have such quality lowered. It is and will be the aim of such makers to preserve such standard, believing that railroad men will appreciate this course by duly discriminating between what is sterling and genuine and what is counterfeit, and what is, moreover, an infringement upon legally guaranteed rights. The peculiar form of the steel bars of which this spring is made is covered by patent, and is the legal and rightful property of the owners.

Another instance to which we will refer is the so-called Rubber Center Spiral Spring, used in groups and mostly for freight service. A spurious and cheapened article has been introduced into the market within the past three years and during the pendency of a suit brought against the infringers. The reputation of the spring suffered somewhat in consequence, but the rights of the owners have been fully confirmed by a recent decision, and the liability of the infringers clearly established. A further illustration of the deterioration in this class of railway material is strikingly manifest in the Hebbard and Volute car-springs, both of which, as respects their original qualities, have gone down on the run, until there is scarcely any comparison between what they are now and what they once were.

The point we would press upon the attention of buyers is, that in respect to almost every thing pertaining to railroad operation in which mechanical adaptation, integrity of material, and solid utility are concerned, you only get what you pay for if the article is good; but if it is poor, you pay for considerably more than you get.

THE subject for discussion at the next monthly meeting is *Car-Framing*. Professor De Volson Wood is expected to deliver an address upon the theory of strains upon car-frames.

THAT well-known and long-established journal, the *United States Railroad and Mining Register*, of Philadelphia, changed its name on the first of the present month to that of THE RAILWAY WORLD, and is now published in quarto form with new type and greatly improved appearance. The journal, under its new title, will give special attention to railroad interests, and reflect the views and candid judgment of its conductors. It will "recognize the shareholders as the proprietors of corporate property, and whilst demanding justice and equity for the managers, it will strive to stand as an advocate, if not a judge, between the mass of the people and the arrogance, and often despotism, which seems to be a natural concomitant of power, be it political or otherwise."

WITH the beginning of the new year, the St. Louis *Railway Register* will be changed in form and materially improved in appearance. The subscription price will be increased to $3 a year.

WE again request our readers to advise us of any errors they may notice in our Directory of railroad officers. We shall esteem it as a favor to have printed circulars announcing changes promptly iorwarded to us.

THE trunk-line railroads between the East and West are now carrying freight at lower rates than was ever before known at this season of the year.

THE smallest steam-engine on record was made by a Scotchman, named Crawford. It is perfect in every part, and so small that it can be covered by a lady's thimble. It can be worked by steam, but he usually works it by atmospheric pressure, through a flexible tube, with rubber air-receiver. The pet engine was made as an amusement, and to show what could be done. It is undoubtedly the smallest working machine ever made.

A CAR is now in use on one of the French railroads to which the Bessemer steamer system has been applied. The car is hung on elastic springs, and the motion while traveling is said to be almost imperceptible.

WE wish all our readers a Happy New Year. The proceeds may be remitted either in new subscriptions and advertisements, or in renewals of old ones.

Elliptic Springs—Comparative Tests.

FOR some time past, a series of systematic and careful experiments have been in progress in this city for the purpose of testing the merits and capacities of the various kinds of car-springs in the market. The results will in due time be given to our readers in such form as to be of special service to car-builders and others. The tests have been made under the supervision of experienced mechanics, with no bias or design to favor springs of any particular kind, or the product of any manufacturer.

We give at this time the results of such tests only so far as they relate to elliptics, and the comparative merits of the two styles of construction as exhibited in the ordinary pattern now in general use, and the recently introduced Cliff pattern, which differs very essentially from all others. Omitting for the present any detailed classification of the various sizes and modifications to suit special cases, we shall confine ourselves to the tests of such forms as are best adapted to the general requirements of railway service.

The ordinary elliptics used under freight-cars are in the form of couplets, 4 to a car, each weighing 96 lbs., or 384 lbs. altogether. They have 20-inch centres, are 8½ inches high over bands, and consist of 5 leaves of 3 x $\frac{11}{32}$ steel. A set is designed to carry 6 tons of car and 10 tons of load, or 4 tons to each couplet; but in case of overloading, the weight may in extreme cases be increased to 5½ tons per couplet, or 22 tons total load. The modifications of this spring range from 5 leaves 3 x ⅜, to 6 leaves 3 x ¼, and also from 3¼ to 3½ inches width of leaf; but the general form is as above.

The Cliff No. 1 pattern, which is designed to replace the above-described ordinary elliptic, is also in couplets, with 18-inch centres, 8½ inches high over all, 2 outside and 3 inside reinforce leaves of 3 x ¼ steel; weighs 65 lbs. per couplet, or 260 lbs. to a car. The comparative power and capacity of this and the ordinary freight elliptic are shown in the following tests of single couplets:

Weight Applied.	Compression. Ordinary Elliptic.	Compression. Cliff Elliptic.
1,500 lbs	¼ in	⅛ in.
2,500 "	⅜ "	¼ "
3,500 "	$\frac{9}{16}$ "	$\frac{5}{16}$ "
4,500 "	¾ "	⅜ "
6,500 "	1⅛ "	$\frac{9}{16}$ "
7,500 "	$1\frac{7}{16}$ "	$\frac{11}{16}$ "
8,500 "	$1\frac{13}{16}$ "	¾ "
10,500 "	2⅛ "	$\frac{15}{16}$ "
12,500 "	2⅝ "	$1\frac{1}{16}$ "
14,500 "	$3\frac{1}{16}$ "	1¼ "
16,500 "	$3\frac{1}{16}$ "	$1\frac{7}{16}$ "
17,500 " band to band	$3\frac{7}{16}$ "	1½ "
18,500 "		1⅝ "
20,000 "		1⅞ "

When the pressure upon the ordinary elliptic reaches 8000 lbs. or thereabout, or 32,000 lbs. per car (which is about the full weight of car and ordinary load), the spring virtually dies out; there is an utter lack of resilient power, its movement is lifeless, and with but little or no recovery from any sudden impact or strain given it by the lever. The addition of another 1000 lbs. to the pressure entirely extinguishes the spring as regards any power of reaction; and at a pressure of 17,500 lbs. it is wholly closed or brought band to band, this weight being equivalent to 35 tons on a full set.

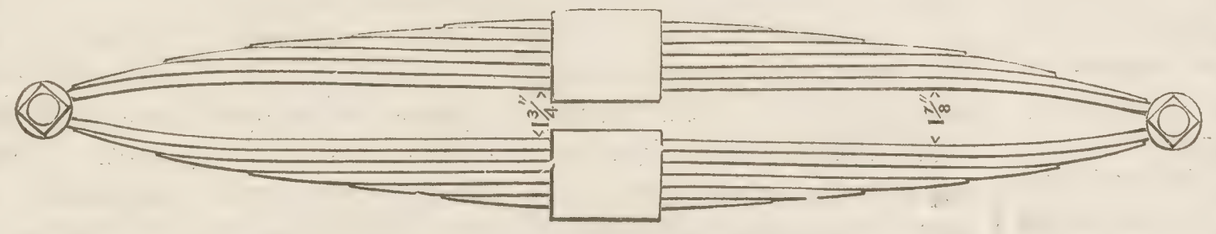
The Cliff spring under a pressure of 8000 lbs. has a great reserve of power. With the addition of 2000 lbs. more, it has a free and elastic action of ¾ in. under the strain; and under a pressure which closes the common elliptic, it still responds with decided alacrity; and with even 20,000 lbs. the action is not entirely exhausted. It does not under this ordeal become an inert mass of metal, but on being relieved of the strain recovers itself with no trace of injury, and is ready for a repetition of the test.

The ordinary elliptics as used under passenger-cars are in triplets, with 6 leaves of 3 x $\frac{11}{32}$ inch steel, 36 inch centres, and 14 inches high over bands. Each triplet weighs 270 lbs. The modifications are 5 leaves 3½ x $\frac{5}{16}$, and 6 leaves 3½ x ¼, with intermediate sizes, the weights per triplet ranging from 270 to 300 lbs., and even when set in duplicates, as is usual for 6-wheel trucks, the weight per car is 1080 to 1200 lbs. The following is a comparative test of 36-inch triplets of the Cliff and regular patterns respectively:

Weight Applied.	Compression. Ordinary Elliptic. Weight, 270 lbs.	Compression. Cliff Elliptic. Weight, 185 lbs.
2,500 lbs	——	1 in.
4,500 "	2¼ in	1¾ "
7,500 "	3⅜ "	2⅝ "
10,500 "	5⅜ "	3¼ "
13,500 "	$6\frac{13}{16}$ "	5⅛ "
16,500 "	8¼ "	6¾ "

In this test, the ordinary elliptic is exhausted, or compressed band to band, at 8¼ inches, while the Cliff has a reserve of two inches in which it works freely. The same difference in resistance and power of reaction is shown in this as in the previous test of the smaller springs adapted to freight service. It will be observed that the difference in weight is 33 per cent in favor of the Cliff freight-spring, and 50 per cent in favor of the passenger-car spring; yet they do more work, have a better action, and a reserve of power which can be made available in the contingency of an overload. The intermediate sizes of the common elliptic, designed to meet the special requirements of car-builders, show the same results under test, and we regret our space will not at this time permit us to give them in detail.

To exhibit more clearly the inherent defects of the old style as compared with the new, we give a representation of a 36-inch spring made by one of the best



manufacturers. The cut shows the shape it assumes under a weight of 13,500 lbs. per triplet, or 27 tons per set. Its height over all, light, is 13½ inches; weight per triplet, 270 lbs. The weak point is shown to be at the centre or in the band where the most action is. The actual length of frictional surface in a 36-inch centre ordinary elliptic, triplet pattern, is 18 feet, 6 inches; while in a 36-inch centre Cliff triplet, it is only 7 feet, 9 inches. The 20-inch centre ordinary duplex freight elliptic has 8 feet, 7 inches frictional surface; while the Cliff spring of same size has only 4 feet. The distribution of the material in the latter is uniform from centre to centre; the inside leaves have a rolling rather than a sliding action; the frictional surface is reduced more than fifty per cent; hence it sustains more weight with a given elasticity, and has a greater capacity of reaction.

Malleable Castings and Dead Weight.

To the Editor of the National Car-Builder:

DEAR SIR: One of the chief problems of car-construction is the reduction of dead or non-paying weight. Could this burden be reduced twenty, or even ten per cent. below what it now is, the aggregate saving would amount to a very large sum, and materially assist in solving the problem of cheap transportation. There are approximately on all the railroads of the United States and Canada, 14,000 passenger-train cars, and 125,000 box or merchandise cars. These, with the various other kinds, would probably make a grand total of not less than 375.000. If we take as a basis for calculation an ordinary box-car weighing 10 tons, with a capacity for carrying 10 tons of freight, and reduce its weight one ton without lessening its capacity, we are enabled to carry 11 tons of freight instead of 10 tons, with no additional tax upon the motive power. In other words, we substitute a ton of paying weight for a ton of dead weight; and by estimating the receipts from this increased capacity at the rate of one cent per ton per mile, on an annual mileage of 16,000 miles, we have $160 per year, provided the car is worked to its full capacity of 11 tons. What the total amount of increased receipts would be for all the box-cars on our roads, may be roughly estimated on the above basis, making due allowance, of course, for incidental drawbacks. There is also another element to be considered in behalf of such a change. It has been stated by three leading railroad officials, that in their judgment it costs the roads $1 per pound to "wear out" dead weight. If this be so, there would be an additional saving of $2000 upon every car when it is worn out, or during its proper lifetime.

Now, how can this reduction in weight be effected? How can cars be made as cheaply, as durable, and as strong as they now are, and at the same time so much lighter as to materially reduce the cost of hauling the present enormous proportion of non-paying weight? How and where can we make a beginning? for it is obvious that unless a beginning is made somewhere, and in some way, the desired reduction will never be accomplished. Evidently there must be a substitution of materials different from what are now employed, or else there must be a different and more judicious combination of the same materials. Let us take, for example, the item of castings, of which there are, in an average passenger-car, say 3000 pounds. By substituting for the common gray iron castings a good quality of malleable iron, the weight per car may be reduced 40 per cent., with a very considerable gain also in strength and durability, and with slight increase in first cost. It may be said that railroads at present utilize their own scrap to great advantage by working it up in their own foundries; but if it costs a dollar a pound to wear out the superfluous weight as compared with that of malleable iron, they might better sell their scrap, or throw it away, or construct annealing furnaces, than to keep up such a drain on their resources. It may also be objected that the use of malleable castings would necessitate a change in patterns and dimensions. This, however, is not the case, as the castings could be greatly reduced in weight by coring, paneling, and ribbing, without any change of size. Some roads are already using malleable centre-plates, brake-heads, and brake-shoes, with good results.

Of the foundry establishments that make malleable castings for railway use a specialty, we may mention The Tuttle & Whittemore Co., of Naugatuck, Ct., and The Chicago Malleable Iron Co., and there are others perhaps that turn out more or less of this product, the consumption of which by railways is increasing every year. X.

MESSRS. WEIMER & BIRKENBINE, of Lebanon, Pa., have contracted for the building of 500 coal-cars for the Central Railroad of New-Jersey.

THE Supreme Court at Washington recently decided that steamboats passing railroad draw-bridges did so at their own risk; that owners, masters, and pilots of steamers must accommodate themselves to the exigencies of commerce; that railroad bridges over navigable waters are necessities, and that steamboats must use all reasonable precautions against injury in passing them.

JOHN W. GARRETT has been unanimously elected President of the Baltimore and Ohio Railroad by its board of directors, for a seventeenth term. He positively declined an increase of his salary, and it was fixed at the old rate of $4000.

THE Cincinnati *Commercial* says that the latest argument in favor of narrow-gauge railroads is that when a locomotive runs over a man at least two-thirds of his body is left in good condition for identification.

THE Toronto Car-Wheel Company are executing a large contract for wheels for a railway in the Argentine Republic, this being the third contract the company have received from part of South-America.

Car-Builders' Monthly Meeting.

THE regular monthly meeting was held at the rooms of the Association, 113 Liberty street, on the evening of the 17th December. There was a good attendance, embracing numerous car-builders and the representatives of a number of car-wheel manufactories.

The meeting was called to order by Mr. LEANDER GAREY, the President of the Association, who announced that the subject of discussion was Car-Wheels—the best method of fitting; flange-wear and causes; mileage and breakage. In making the announcement, Mr. Garey said he had been requested to ask why old wheels could not be remelted and recast. The iron at present seemed to be comparatively good for nothing after it had once been melted. He thought there should be some process by which old wheels could be made available as material for new ones; yet wheel-makers objected to taking old ones to be used a second time in manufacture.

MR. JONATHAN SCOVILLE, of J. & N. C. Scoville, Buffalo, remarked that if old wheels were uniform in quality and sufficiently soft, there would probably be no objection to their use as material for new ones. But they are in fact never uniform, and as a general thing they are hard, and when melted get still harder. In an average lot of old or returned wheels, for every hundred fit for remelting, there were three hundred that were not fit.

MR. W. W. SNOW, of the Ramapo Car-Wheel Works, said that nearly all wheels are supposed to be made of charcoal iron. If these wheels, when used a second time, were remelted with charcoal, he thought they would not deteriorate; but as anthracite coal was generally used in melting, and as this contained more or less sulphur, the iron becomes impregnated with it, and the quality is impaired in proportion. He had observed that after the sulphur was once in the iron, there was an increased tendency to absorb more of it, and that the second and third melting, and perhaps the fourth, produced nothing but common anthracite iron unless soft charcoal iron is mixed with it at each melting. He spoke of an attempt he had made some years ago to cast a lot of wheels from No. 3 Salisbury iron. After two failures he succeeded in getting a chill, but the wheels were so brittle that it was unsafe to ship them, and he then became satisfied that the failure was due to the sulphur which was contained in the anthracite coal. He thought old wheels remelted with charcoal would be good. A French experimenter succeeded some years ago in getting an increase in the strength of iron up to about seven meltings, but the iron used was a coke iron of a very low quality.

MR. SCOVILLE said if No. 1 Salisbury iron is remelted it will increase to No. 4; remelt it again and the specific gravity will increase, but the iron has virtually no strength at all, and that is really the trouble with old car-wheels. If the wheel is good, the metal is already at its maximum strength; if the wheel is a poor one, the iron is past its maximum. The maker must use his judgment, in case the wheel is a good one, as to what should be mixed with it to increase its strength.

MR. F. D. ADAMS.—Then melting with charcoal would not restore the original strength of the iron?

MR. SCOVILLE.—It would not have the same deteriorating effect that anthracite would; but it would not entirely restore the strength, for the reason that the blast keeps burning the carbon, and the iron becomes brittle. Nearly all car-wheel irons in this country have a specific gravity of 7.25, below which they will not chill at all, and above which they become so brittle that they are practically white iron.

MR. ADAMS.—If I understand Mr. Snow, there is a certain amount of sulphur in coal which impregnates the iron in melting. Would not the wheels be improved if they were melted with coke, which contains less sulphur than coal?

MR. SCOVILLE.—We use coke almost entirely.

MR. SNOW said it was very difficult to get coke that was free from sulphur.

MR. D. A. HOPKINS inquired if a portion of No. 3 iron be added to an old wheel which had been hardened to a point beyond No. 4, would not such addition bring it back to No. 4?

MR. SNOW.—Yes; but the trouble is to hit upon just the requisite proportion. He thought all wheel-makers would agree that the pig-iron of which wheels were made invariably had a greater tensile strength than after they were remelted, and it was a question whether the sulphur in the anthracite coal did not have something to do with it.

MR. W. R. DAVENPORT, of the Erie Car Works, asked whether some other disposition could not be made of old wheels than putting them into new ones. Old wheels mixed with pig-metal in a puddling furnace will give splendid results in rolled bar-iron. Every railway company uses enough merchant bar-iron to consume every old wheel that they have to sell. Then why should wheel-makers be expected to take old wheels when they can be sold to the rolling-mills, where they can be used to advantage, and the quality of the iron improved? He thought no reputable wheel-maker wanted old wheels. He could not put old wheels into new ones and put his company's name on the latter; he could not afford to do it, neither could the railroads afford it. The companies will find that out. The attempt to force old wheels into new ones necessitates one of two things: either the doing of it to the detriment of the new ones, or the selling of the old ones at a loss; while the roads might exchange them to better advantage with the rolling-mills. With reference to remelting, he thought anthracite coal might be selected that was free from sulphur, but most of that in the market contained so much sulphur that he had been forced to use coke that was most free from it, and others had done the same. He thought that tests of iron taken from car-wheels would not show any very great depreciation, or that much breakage would occur among first-class wheels. There were, of course, some wheels made of anthracite iron that would not stand; but if the roads were disposed to pay a fair price for a good wheel, they could get wheels that would not break.

MR. ADAMS said the idea of working up old wheels into bar-iron was entirely new to him. If this was so, there ought to be no trouble in getting rid of old wheels.

MR. SNOW said he had known this to be a fact for some years. His company had been obliged to take a few old wheels, and had supplied parties with a certain number annually who put them into plate-iron, and the testimony was that such plate-iron was the best of any in the market. The old wheels are first puddled, of course, and go through the regular process, which necessitates an increase in the cost of plate-iron, and it would be the same with bar-iron; consequently, if railroad companies give us the wheels to put into new iron, they must expect to pay more for the iron produced. That the iron is better there is no question, according to the testimony of the best iron-makers in the country.

At the suggestion of the Chairman, the subject of Wheel-Fitting was next taken up.

MR. W. E. CHAMBERLAIN, of the Boston & Albany R. R., said their wheels were bored out at a $\frac{3}{64}$ inch taper, and the axles turned the same and fitted under a 30-ton pressure.

MR. ADAMS said that most wheel-fitters try to adapt the pressure to the strength of the wheel; that is, if 40,000 lbs. are applied and it is found the wheel will not bear it, the pressure is reduced to 10 or 15 tons. There are wheels that will stand 75,000 or 80,000 lbs., and not show any signs of fracture, while others will fracture at 25,000 or 30,000 lbs., but of course this does not affect the question of what would be right. The wheels at the Boston and Albany road shops were fitted at about 50,000 lbs., and they had very few loose ones.

MR. M. N. FORNEY asked if soft wheels were not pressed on harder than those that were hard, and if when a wheel was hard it was not necessary to have a larger diameter of axle. If a tapered axle is pressed into a straight hole, it would tend to split the wheel.

MR. ADAMS said that the difficulty in fitting wheels was owing to the fit not being perfect; it bears on either one end or the other of the hub. The closer the fit the less the necessity of a severe strain.

MR. M. P. WOOD said his experience was that it was almost impossible to bore a straight hole with an ordinary wheel-boring machine. The cutter will invariably wear away on the inside of the face, and as soon as the edge of the cutter drops on the outer face of the wheel, it is shoved off and leaves the wheel slightly tapering. A firm wheel will apparently resist the wear of the tool more than a soft one. He allowed $\frac{1}{64}$ of an inch in the axle; 15,000 or 20,000 lbs. is all the pressure necessary for half the distance, but for the last $1\frac{1}{2}$ inches it will rise rapidly to even 40,000 lbs. His practice had been not to allow a wheel to leave the press until this pressure was reached, with a gauge to bring it home, and he never had a wheel work loose at this pressure.

MR. DAVENPORT said that the allowance would depend of course upon the quality of the wheel. Some were so soft as to admit of $\frac{1}{64}$, and possibly $\frac{1}{32}$, allowance; others were made of such close, dense iron, that $\frac{1}{100}$ of an inch would give all the pressure needed. He once had this called in question by a master mechanic and a general superintendent, and he invited them, together with two other railway officials, to test the matter They were requested to press the wheel on, and to caliper both wheel and axle with an allowance of not more than $\frac{1}{100}$ of an inch. The wheel was bored straight and the axle turned straight, and the pressure given was 125,000 lbs. There were of course different opinions about straight and tapered fits, but if he were going to risk his life upon either he would take the straight one. On a road which had no compromise cars a tapered fit might do. The pressure would all the time be inward. But with compromise cars a smart blow on the inside of the wheel, in passing rapidly over a frog, might loosen the wheel. Certain it is that if a wheel put on at a taper gets a blow so as to start it a thousandth part of an inch, it is loose; while with a straight fit, if it was started this much, it would probably not cause any damage. He had a good deal of fitting to do for cars that run over long stretches of road of different gauges, and had found it necessary to put the minimum pressure at 60,000 and the maximum at 125,000 lbs. Wheels that exceeded or fell short of this were taken off and pressed on again. It was not best to put a needless strain on wheels by making the axle a wedge. It is possible to burst any wheel, but any one with a proper fit will indicate all the pressure needed without any danger of bursting.

MR. ADAMS had noticed that the axles of many cars had abrupt square shoulders of $\frac{1}{8}$ or $\frac{1}{16}$ of an inch, immediately back of the hub. Did not such shoulders make the axles weaker than it would to run them straight back?

MR. SNOW was of the opinion that it would be better to have no shoulder at all. If there was one, especially on a rolled axle, vibration would almost invariably cease at that point. In a hammered axle, perhaps not so much so. Iron would granulate from vibration, and this was one reason why hammered axles were considered so much better than rolled ones; and he believed if they were turned down in the middle, better results would be realized from rolled axles.

MR. L. GAREY said the road with which he was connected some eighteen years ago had a good many broken axles, and on examination many of them were found to be turned with a shoulder at the inner end of the hub, while many of them had a slight check at the shoulder. He then had them made without shoulders, and in no instance had they broken at that point, which to his mind was conclusive against shoulders at the point he had named. As to tapered wheel-fits, he disapproved of them, especially for broad-tread wheels running over different gauges.

Mr. Chamberlain thought that 99 wheels out of 100 were bored with a tapered hole after we had done our best, and that a strain was put on the outside end instead of uniformly along the bore. A wheel pressed on at a $\frac{3}{16}$ taper with a thirty-ton pressure will require seventy tons to press it off again. A great many more loose wheels that were straight came over the Boston and Albany road than there were tapered. He had put in last month 18 wheels that were straight, and all broad-tread at that.

Mr. Lobdell, a son of the proprietor of the Lobdell Car-Wheel Works, of Wilmington, Del., read a paper written by his father giving some of the results of his 40 years experience as a car-wheel maker. He pressed on his wheels at a pressure of from 30 to 40 tons, and had never had any complaints of loose wheels. Flange-wear was produced by several causes, among which were mistakes in gauging and marking the wheels and differences in the hardening of the chill. Fewer accidents were caused by broken wheels than by broken rails or other material, because more care was generally bestowed on their manufacture, and they were more thoroughly tested. His practice had been to break up all wheels that were at all doubtful, preferring to break up a hundred rather than run the risk of one doubtful one. Breakage in service resulted from inherent defects in patterns, or from reduction in weight in order to lessen the cost. The defects in the chill he thought were not due to the particular kind of iron used, but rather to the manner in which the ore had been smelted, or to want of care. He had got perfect wheels from hematite, magnetic, specular, and other ores, and also from mixtures of ores. All chilled wheels were liable to blotches or blisters, which of late have become more common, especially on tender wheels and others of small diameter. These blemishes, although unsightly, are not dangerous. Some specimens of wheels were exhibited by Mr. Lobdell, which had been broken through the blisters on the tread, showing that the blisters were only surface defects, and that the iron was sound underneath. One of these wheels (28-inch), made of hematite ore, had run 70,000 miles under a 32-ton engine whose speed was 40 miles an hour.

Professor R. H. Thurston, at this point, read a report of the tests of iron submitted to him at the last meeting.

The Chair announced that the Mileage of Car-Wheels was the next subject in order.

Mr. Washburn, of the Washburn Car-Wheel Co., of Worcester, Mass., said that for the last four or five years he had been making wheels of steel, and had not yet been able to get a satisfactory comparative statement as to the merits of steel and iron. The iron wheels of all makers varied very greatly. Steel wheels, if perfect, he thought would eventually take the place of iron, and that their mileage would exceed that of iron, six or perhaps eight to one, and would average 250,000 or 300,000 miles; while a chilled wheel had to be a good one to average 40,000 miles. A steel wheel costing $50 would have to run from 100,000 to 125,000 miles to be as cheap as an iron wheel that would run 40,000, but probably the average of the latter would not exceed 30,000. He thought a steel wheel would run from 100,000 to 150,000 miles without turning, and would stand turning two or three times before it was worn out. He had wheels now that had run 300,000 miles and were still good.

Mr. Adams said that almost all wheel-makers claimed, and no doubt in good faith, that wheels were run 50,000 miles—and railroad companies had assumed such to be a fact yet no railroad company could give the mileage of wheels. Trains were so much broken up in running from one road to another, and by irregular running, that the mileage could not be kept with any accuracy.

Mr. Scoville had 36 cast-iron wheels on the New-York Central road between Buffalo and Rochester, 2 of which had made 150,000 and 2 close upon 200,000 miles; the other 32 had died out long before. Out of 35 others returned, and whose total mileage averaged 48,000 miles, 24 made less than 30,000, while the other 11 ranged from 60,000 to 85,000. He did not think he had ever made any engine-wheels that would average 50,000. To increase the mileage the iron had to be made denser, and when a man undertook to work every wheel up to 50,000 he believed he had a bad job on his hands. The wheels of which he had spoken were mostly 26 and 28-inch—no 33-inch.

Mr. Adams said he found wheels run very differently—from 8000 to 80,000 or 90,000 miles. There was about one good one to every three bad ones.

Mr. Davenport said it had been supposed to be impossible to keep the mileage of any thing but engines, but the Lake Shore road had found a way of keeping the mileage of passenger, baggage, mail, and express cars. Each conductor between Buffalo and Chicago reported what cars he took from the beginning of his trip and what cars he left at the end, and there was no difficulty in this way in getting at the mileage. The report on 1st of April last showed that the wheels removed during the previous six months had averaged over 57,000 miles, and the smallest average he believed was 54,000. These were 33-inch wheels that had run under heavy cars at a high speed. Tke Lake Shore, he admitted, was not as hard a road for wheels as some others. With respect to iron wheels, he had some in mind that had run 200,000 miles and were good yet. He had the means of determining the data himself. Iron wheels will make a large mileage as well as steel wheels; they are not exhausted at 40,000 miles. There may be on some roads bad wheels that make small mileage. He had nothing to say against steel wheels, but he wanted iron ones to have a fair chance. They are capable of being greatly improved, as well as steel; but it was necessary that the mileage of passenger-cars should be kept, and he called on the master car-builders to insist that this should be done. As respects freight service, mark the date on the wheels when they are put on and when taken off, and knowing about the distance the cars run in a year, the mileage made between such dates can be calculated with approximate accuracy, while that under passenger-cars would be positive.

Mr. Snow said the Ramapo Works sold their wheels to the Pullman Car Company on a mileage basis of 50,000 miles, receiving credit for any excess and standing the loss for those that fell short, and it was a long time since they had paid any losses. He mentioned this merely for the information of those who thought chilled wheels would not make over 40,000 miles. The lowest average for the last six months was about 59,000. He believed wheel-makers could do much to improve the quality of their wheels by attention to details. He had noticed several years ago that the manipulation of the cupolas did not give as good results in dry sultry weather as in damp weather. He commenced turning a stream of water on the iron before charging, and with good results, and he had carried the experiment further by injecting a stream into the cupola, which produced still better results. He thought wheels could be made to give a general average of 60,000 miles. As for mileage records, it would take three or four years to make a complete record, because there were some wheels that would run that length of time.

Mr. Scoville said it might be possible to get a general average of 60,000 miles out of 33-inch wheels, but he would rather guarantee 40,000.

Mr. Lobdell, referring to the statement that wheels did not make the mileage now that they did years ago, said that years ago a broad-tread wheel was an exception. Narrow-tread wheels were then mostly used with a play of $\frac{1}{2}$ or $\frac{3}{4}$ inch, allowing the tread to wear all over the surface. Most broad-tread wheels were set to $\frac{1}{4}$ inch, and he had seen wheels taken out after 50,000 or 60,000 miles had been run, where the edge of the tread hardly had the chill marks worn off.

Mr. Wood thought it would be very difficult to ascertain the mileage of a passenger-wheel on account of the prevailing custom upon most roads of removing the wheels after they had run a year. He had examined the Lake Shore road's system of mileage, and could testify to its minuteness and accuracy.

Mr. Forney had talked with railroad officers about keeping accurate mileage, and they said the cost was so great that it didn't pay; the results would not warrant the expenditure. An officer of the Erie Railway had said that the cost of keeping the mileage on that road would be about $10,000 a year. [Some doubts being expressed that this estimate might be too high, Mr. Wood, in reply to inquiries, said that the number of clerks employed in this work on the Lake Shore road was about fifteen.]

Mr. Chamberlain here produced a paper from which he read a record of the mileage of certain lots of wheels: 588 wheels made 19,173,678 miles, or a total average of 32,608; 1682 33-inch wheels in passenger service, averaged 35,723 miles. Of 1800 steel wheels put on, the largest mileage was 320,388 miles, and the wheels good to all appearance for as much more. They were running under a guaranty of 100,000 miles, and still in perfect order. Of 72 defective steel wheels, the smallest mileage was 9300, and the largest 237,000, the average mileage being 79,562. These are under coaches weighing from 20 to 25 tons, the majority of them 20 tons, and have a run of 200 miles.

The discussion was here closed.

Mr. Forney moved that the subject for discussion at the next meeting (January 21) be *Car-Framing*, and that Professor De Volson Wood be invited to address the meeting in regard to the theory of strain upon car-frames; which motion was agreed to.

Mr. C. A. Smith requested that car-builders bring their plans for framing, so that we could have something tangible to talk about.

The meeting then adjourned.

Locomotive Snow-Broom.

The Phenix Steel-Wire Broom and Brush Works, of Chicago, are supplying railroads with a steel-wire broom made of steel wire to be attached to locomotives forward of the truck-wheels for the purpose of keeping the track clear of light snow and other obstructions. They are so arranged that they can be lifted clear of the rails when their use is not required. They have been tried on many roads, and are found to be both durable and serviceable. We refer to advertisement on page iii.

Fairbanks' Scales.

The business of manufacturing these scales, embracing the various kinds adapted to railroad uses, has increased at such a rate as to become one of the great industries of the age. The demand for the products of the company at home and abroad has grown to such proportions as to require the establishment of warehouses in all our principal cities, and also a special agency in London under the direction of Mr. George Ewing, Jr., formerly of the Philadelphia house. As an evidence of the extent to which the merits of these scales are recognized, they are made to weigh according to the various European and Asiatic standards, and the weights are stamped with Turkish, Chinese, Japanese, and other foreign numerals. In Russia the American scale has attained great popularity, the railroad from St. Petersburg to Moscow being already fully equipped with them; and even in England, where the greatest prejudice always exists against any foreign article which claims advantage or improvement over the native product, the Fairbanks scales are meeting with considerable favor and recognition, so that large orders are now received from the English agency. In Cuba all the custom-houses are furnished with the standard weighing instruments; and in Chili, and in fact on the entire west coast of South-

America, the railroads have adopted the scale into general use. The foreign trade of the company has increased the present year nearly 15 per cent over 1873.

THE value of the newspaper was well illustrated at a farm near Hartford, Connecticut, the other day. A train on a New-Haven road struck an ox, which was dragged into a neighboring field and left for dead. The next morning Charles Mather went into the field, and after yoking up his cattle, did some ploughing. He noticed nothing peculiar about his cattle, but after returning home he picked up a newspaper, and coming across an account of the accident to an ox, he became convinced that the slaughtered animal was one of those he had been ploughing with. How he arrived at this conclusion would puzzle any but a Yankee to guess. However, there was money in it, probably; and Mather went back to the field, and sure enough he found scars on one of the oxen he had been using. He now claims damages from the railroad company; though it may be safely said that, but for the newspaper, he never would have known how badly damaged he was, or that he was damaged at all.

IT is said that a patent for a new process for manufacturing steel has been granted to parties in Atlanta, Ga. By this process, it is claimed that steel of all kinds can be made, from the highest to the lowest quality, and at a cost of only four dollars per ton more than the cost of making iron. It is also said that this steel can be re-rolled as easily as iron.

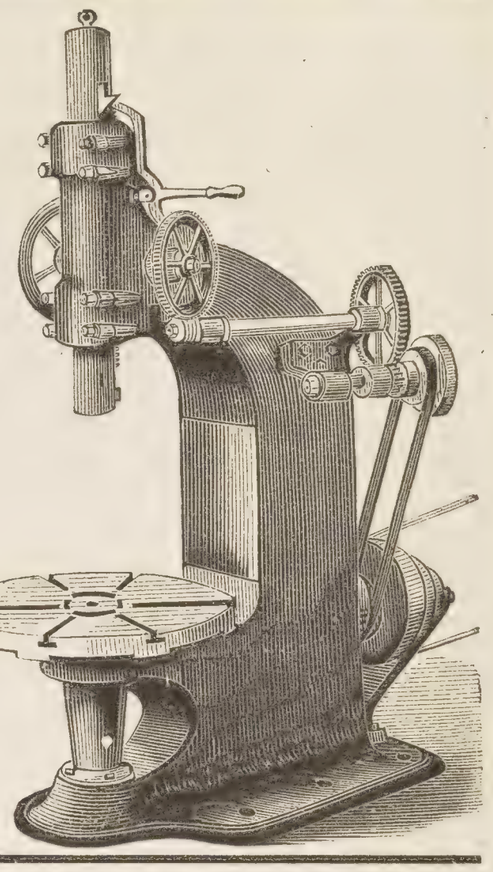


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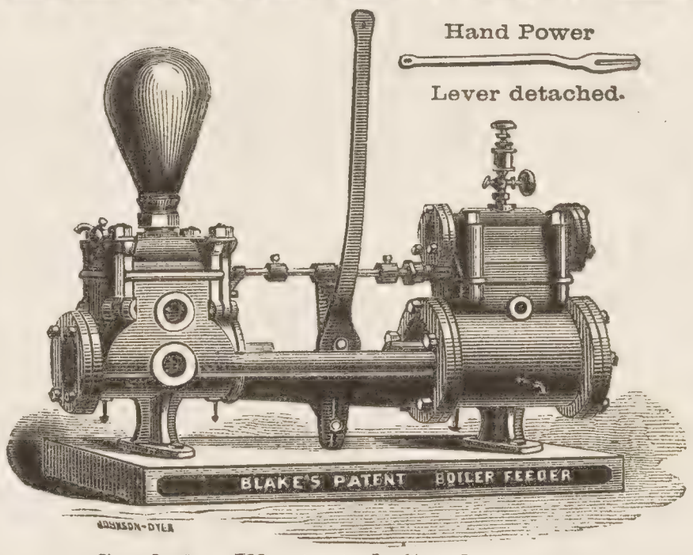
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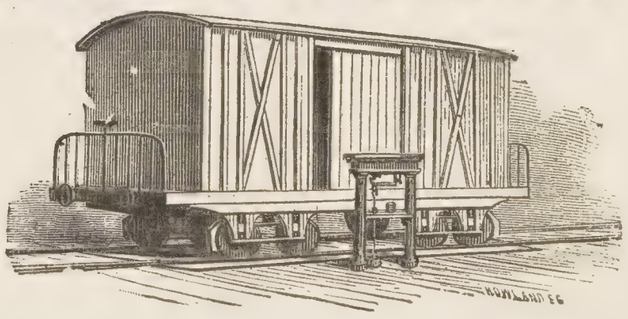
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Arlington Car Manufacturing Co	Arlington, Vt.
Barney & Smith Manufacturing Co	Dayton, Ohio.
Baker, Jackson & Co	Latrobe, Pa.
Bellefonte Car Manufacturing Co	Bellefonte, Pa.
Billmeyer & Smalls	York, Pa.
Bradley, Osgood	Worcester, Mass.
Bridgeport Car-Works	Bridgeport, Pa.
Brill, J. G. & Co	Philadelphia, Pa.
Buffalo Car Co	Buffalo, N. Y.
Canada Car Co	Toronto, Canada.
Canda, F. E. & Co	Chicago, Ill.
Cape Fear Building Co	Abbottsburg, N. C.
Cartersville Car Co	Cartersville, Ga.
Central Car & Manufacturing Co	Jackson, Mich.
Clendenning, W. W	Montreal.
Cummings Car-Works	Jersey City, N. J.
Connellsville Machine and Car Co	Connellsville, Pa.
Corunna Car Co	Corunna, Mich.
De Pere Iron-Works	De Pere, Wis.
Detroit Car-Works	Detroit, Mich.
Detroit Car and Manufacturing Co	Detroit, Mich.
Dawson Manufacturing Co	Dawson, Ga.
Dickey, Neill & Co	Toronto.
Dickson Manufacturing Co	Scranton, Pa.
Erie Car-Works	Erie, Pa.
Elmira Car-Works	Elmira, N. Y.
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Freas Brothers & Thornton	Berwick, Pa.
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Gardner, F. & Co	Carlisle, Pa.
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Gilbert, Bush & Co	Troy, N. Y.
Goold, James & Co	Albany, N. Y.
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Hannibal Car Works	Hannibal, Mo.
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Harrisburg Car Manufacturing Co	Harrisburg, Pa.
Heathcote, Herbst & Co	Glen Rock, Pa.
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Jackson & Woodin Manufacturing Co	Berwick, Pa.
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Pittsburg Car and Locomotive Co	Pittsburg, Pa.
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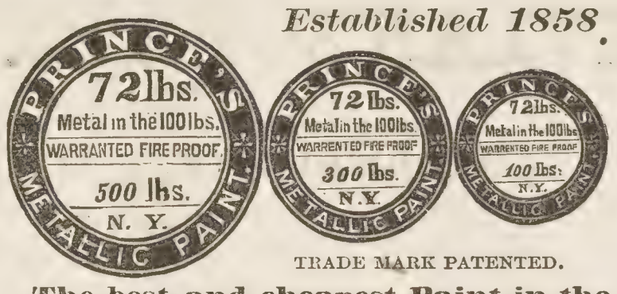
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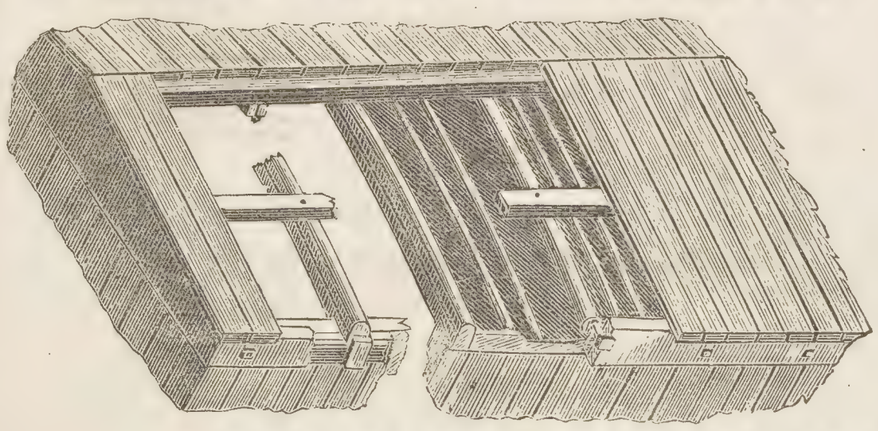
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B

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C

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Cumberland Valley	A. S. Hull	C. W. Nitterhouse.	Chambersburg, Pa.
Cumberland & Pennsylvania	W. L. Jordan	Nathan Binnix	Mt. Savage, Md.

D

Dakota Southern	Jas. Whitney	A. A. Meckling	Yankton, Dak.
Danbury & Norwalk	Charles A. Craig.	C. A. Craig	Danbury, Ct.
Davenport & St. Paul	James Russell		Davenport, Iowa.
Dayton & Union	A. J. Keenan	J. F. Feicht	Dayton, Ohio.
Dayton & Michigan	John Black	W. H. H. Allison	Cincinnati, Ohio.
Delaware, Lackawanna & Western	Walter Dawson	Robert McKenna	Scranton, Pa.
Morris & Essex Division	W. H. Lewis	L. S. Barber	Hoboken, N. J.
Denver & Rio Grande	John Greenwood		Denver, Col.
Detroit, Ft. Wayne & Logansport	W. A. Carpenter		Bankers, Mich.
Detroit & Milwaukee	Andrew Wilson		Detroit, Mich.
Detroit, Lansing & Lake Michigan	Tho. E. Roberts		Ionia, Mich.
Delaware & Hudson Canal Co.	‖‖R. C. Blackall		Albany, N. Y.
Dorchester & Delaware			Cambridge, Md.
Dubuque South-Western	James Rollo	James Rollo	Farley, Iowa.
Dutchess & Columbia	W. G. Vanbuskirk	H. A. Webster	Fishkill, N. Y.
Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett	Dunkirk, N. Y.

E

Eastern		J. P. Somerby.	Salem, Mass.
Eastern	John Thompson		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L. Weaver	Riverton, Ky.
East-Tennesee, Virginia & Georgia	C. A. Hodge		Knoxville, Tenn.
Erie Railway	§§Frank K. Hain		Susquehanna, Pa.
Erie Railway	Robert Wallace		Susquehanna, Pa.
Erie Railway	V. Blackburn		Jersey City, N. J.
Erie Railway	F. M. Wilder	M. Wilder	Buffalo, N. Y.
Erie Railway	J. W. Chapman	J. W. Chapman	Hornellsville, N. Y.
Erie Railway		‖D. B. Goodell	Elmira, N. Y.
Erie Railway		‖J. B. Hill	Jersey City, N. J.
Erie Railway	J. Van Vechten	J. Van Vechten	Port Jervis, N. Y.
Erie Railway	A. T. Back		Rochester, N. Y.
Erie & Pittsburg	G. J. Parkin.	G. J. Parkin	Erie, Pa.
European & North Am. (of Maine)	A. O. Bailey	J. H. Brown	Oldtown, Maine.
Evansville & Crawfordsville	John L. White	Joseph Stiker	Evansville, Ind.
Evansville, Terre Haute & Chicago			Terre Haute, Ind.

F

Fitchburgh	Geo. A. Cooledge	Enos Varney	Charlestown, Mass.
Fitchburgh & Worcester	John Webster	Samuel Stevens	Fitchburg, Mass.
Flint & Pere Marquette	Sanford Keeler	‖R. B. More	East-Saginaw, Mich.
Florida	Ezra Gray	G. Hernandez	Fernandina, Fla.
Flushing & North Shore	Wm. La Suer	C. Wilkinson	Hunter's Point, L. I.

G

Galveston, Harrisburgh & San Antonio	Palmer Cady		Harrisburgh, Texas.
Galveston, Houston & Henderson	Jno. G. Coulon	Wm. Macbeth	Galveston, Texas.
Georgia	William Hardman.	T. M. Preval,	Augusta, Ga.
Gilman, Clinton & Springfield	W. B. McKenna		Springfield, Ill.
Grand Tower & Carbondale.	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk		Warren Noyes	Gorham, Me.
Grand Trunk	†Herbert Wallis	Wm. McWood	Montreal, Canada.
Grand Trunk			Sherbrooke, Can.
Grand Trunk		B. J. Mitchell	Portland, Me.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne, Ind.
Great Western of Canada	†Wm. A. Robinson.	F. Childs	Hamilton, Canada.
Green Bay & Lake Pepin	J. H. Erwin.		Green Bay, Wis.
Greenville & Columbia	R. H. Anderson	R. H. Anderson.	Helena, S. C.

H

Hackensack & New-York.	Abra'm Angausen		Hackensack, N. J.
Hanover Branch	John J. Bingley	Henry Britcher	Hanover, Pa.
Hannibal & St. Joseph	**Jno. MacKenzie		Hannibal, Mo.
Hartford, Providence & Fishkill	Edwin Garfield	V. D. Perry	Hartford, Ct.
Hempfield	T. Marsh		Wheeling, Va.
Housatonic	C. R. Morris.	J. J. Ferris	Falls Village, Ct.
Houston & Texas Central	L. C. Noble	James McGee	Houston, Texas.
Huntington & Broad-Top Mountain	W. W. Coller	M. Tellerhoof	Saxton, Pa.

I

Illinois Central	**S. J. Hayes	H. O. Wadlie	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia, Ill.
North Division	J. B. Edams		Amboy, Ill.
Iowa Division	Thomas W. Place		Waterloo, Iowa.
Illinois Midland	J. G. Clifford	G. Clifford	Paris, Ill.
Indianapolis, Cincinnati & Lafayette	J. S. Patterson	S. Griffith	Cincinnati, Ohio.
Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Indianapolis & St. Louis	A. J. Sanborn		Mattoon, Ill.
Indianapolis, Bloomington & Western	Tho. V. Losee	A. J. Allen	Urbana, Ill.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ia.
International & Great Northern	R. B. Small		Palestine, Texas.
Intercolonial	Wm. Whitney	Edw. Shaffer.	Moncton, N. B.
Iron	Perry Scott	Clem. Roetling	Ironton, Ohio.
Ithaca & Athens	F. A. Brown.		Ithaca, N. Y.

J

Jacksonville, Pensacola & Mobile	H. D. Kennedy		Jacksonville, Fla.
Jeffersonville, Madison & Indiana	Reuben Wells.		Jeffersonville, Ind.
Junction & Breakwater	J. A. Maguire.		Lewes, Del.

K

Kalamazoo, Allegan & Grand Rapids			Kalamazoo, Mich.
Kansas City, St. Joseph & Council Bluff	Wm. D. Rowley	Wm. D. Rowley	St. Joseph, Mo.
Kansas Central	John Davis		Leavenworth, Kan.
Kansas Pacific	**L. H. Waugh		Wyandotte, Kansas.
Denver Pacific Div	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div	**L. H. Waugh		Wyandotte, Kansas.
Junction City & Ft. Kearney Div	**L. H. Waugh		Wyandotte, Kansas.
Arkansas Valley Div	**L. H. Waugh		Wyandotte, Kansas.
Kentucky Central	J. R. Ledyard	J. L. Hackathorn.	Covington, Ky.
Keokuk & Des Moines Valley	S. W. Wakefield	M. Sessions.	Keokuk, Iowa.
King's Mountain	E. Thomas	E. Thomas	Chester, S. C.
Knox & Lincoln	§§E. R. Hamlin.	Benj. Soule	Bath, Me.
Knoxville & Charleston			Knoxville, Tenn.
Lackawanna & Bloomsburg	Chas. Graham	Chas. Graham	Kingston, Pa.
Lake Erie & Louisville	John Pero		Fremont, Ohio.
Lake Ontario Shore	J. C. Schermerhorn	J. C. Schermerhorn.	Oswego, N. Y.

Railroad.	Master-Mechanic.	Master Car-Builder.	Residence.
L			
Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland, Ohio
Michigan Southern Division	Geo. W. Stevens		Elkhart, Ind.
" " "		S. S. Knapp	Adrian, Mich.
Toledo Division	Albert Congdon	Frank O. Bray	Norwalk, Ohio.
Erie Division	L. O. Gassett	J. Withyecombe	Cleveland Ohio.
Buffalo Division	W. L. Wallace	A. C. Robson	Buffalo, N. Y.
Lake Superior & Mississippi	**H. A. Towne		St. Paul, Minn.
Lake Shore & Tuscarawas Valley	W. F. Turreff		Black River, Ohio.
Lehigh Valley	John I. Kinsey		South-Easton, Pa.
Lehigh Valley	P. Hofecker	E. R. Brown	Weatherly, Pa.
Lehigh Valley	A. Mitchell	Mauch Chunk, Pa.	Delano, Pa.
Lehigh Valley	D. Clark		Hazleton, Pa.
Leavenworth, Lawrence & Gal	S. M. Philbrick		Lawrence, Kansas.
Little Rock & Fort Smith	D. R. Wing	D. R. Wing	Argenta, Ark.
London & Port Stanley			London, C. W.
Louisville, New-Albany & Chicago	Geo. Ruhlandt	Geo. Helfrich	New-Albany, Ind.
Long Island	Chs. A. Thompson	C. A. Thompson	Hunter's Point, L I.
Louisville, Cincinnati & Lexington	S. S. Pilson	S. S. Pilson	Louisville. Ky.
Louisville & Nashville	†Thatcher Perkins		Louisville, Ky.
Louisville & Nashville	D. P. Rennie	Isaac M. Owens	Louisville, Ky.
Louisville & Nashville	Jas. Montgomery		Bowling Green, Ky.
Nashville & Decatur Division	John Skidmore		Nashville, Tenn.
South & North Ala. Div.	Thos Jeffers	W. L. Gude	Birmingham, Ala.
South & North Ala. Div	C. H. Beale		Montgomery, Ala.
Memphis & Ohio Div.	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Louisville, Paducah & So. Western	W. D. Robb	F. A. Felton,	Elizabethtown, Ky
M			
Macon & Augusta			Macon, Ga.
Macon & Brunswick	R. Wagnon	R. Wagnon	Macon, Ga.
Macon & Western	D. M. Gogel	James A. Knight	Macon, Ga
Maine Central	J. W. Philbrick	J. W. Philbrick	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div	John Ellis	C. H. Kenison	Augusta, Me.
Maine Central Division	John F. Merrill.		Waterville Me.
Manchester & Lawrence	Chas. L. Eastman.	M. W. Dickerman.	Concord, N. H.
Marietta, Pittsburg & Cleveland	W. J. Adams		Marietta, Ohio.
Marietta & Cincinnati	E. Bosley	E. Bosley	Chillicothe, Ohio
Marquette, Houghton & Ontonagon	A. P. Burroughs	H. D. Lyons	Marquette, Mich.
Maryland & Delaware	Samuel Peters		Greensboro, Md.
Memphis & Little Rock	Tho. Rennell	P. Twitchell	Argenta, Ark.
Memphis & Charleston	A. Ross	A W. Drew	Memphis, Tenn.
Memphis & Charleston	H. N. Burford	Fabien Varin	Huntsville, Ala.
Mineral Point	Robert Hay	Robert Hay	Mineral Point, Wis.
Mineral Range	C. H. Fox		Hancock, Mich.
Mississippi & Tennessee	Geo. Haszinger	J. Riny	Memphis, Tenn.
Michigan Central	‡A. P. Farrar		Jackson, Mich.
Michigan Central	§§Geo. Chalender	J. B. Sutherland	Detroit, Mich.
Midland Pacific	A. C. Stiles		Lincoln, Neb.
Milwaukee & Northern		W. J. F. Liddell	De Pere. Wis.
Mississippi Valley & Western	J. S. Pickering		Canton, Mo.
Missouri, Iowa & Nebraska	Wm. Adams		Alexandria, Mo.
Missouri, Kansas & Texas	T. G. Gorman		Parsons, Kan.
Missouri, Kansas & Texas		J. Townsend	Sedalia, Mo.
Missouri, Kansas & Texas	J. E. Wiggins		Hannibal, Mo.
Missouri River, Fort Scott & Gulf	John S. McCrum	Alex. Montier	Kansas City, Mo.
Missouri River, Fort Scott & Gulf		Josiah Stahl	Wyandotte, Kan.
Mobile & Montgomery	James McFarland.	L. Barham	Montgomery, Ala.
Mobile & Girard	C. D. Wall		Girard, Ala.
Mobile & Ohio		John McHugh	Mobile, Ala.
Mobile & Ohio	R. McDougal	I. T. Booth	Whistler, Ala.
Mobile & Ohio	B. S. Herring		Macon, Miss.
Mobile & Ohio	R. H. Briggs		Jackson, Tenn.
Montgomery & West-Point	J. McVey	J. T. Daniels	Montgomery, Ala.
Montgomery & Eufaula	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Algiers, La.
Montreal Northern Colonization	§§C. G. C. Simpson		Montreal, Can.
N			
Nashville & Chattanooga	John U. Eastman	J. G. Sawyer	Nashville, Tenn.
Naugatuck	Henry Hanford	George W. Gray	Bridgeport, Ct.
New-Bedford	G W. Reynolds	Robert Chase	Taunton, Mass.
New-Brunswick	P. Logan	C. M. Kinnon	Fredericton, N. B.
New-Brunswick & Canada	Tho. Armstrong	G. Houlton	St. Andrew's, N. B.
New-Haven & Northampton	Henry Fox	Henry Fox	New-Haven, Ct.
New-Jersey Midland	C. J. Clifford.		Wortendyke, N.J.
New-Jersey Southern	Rufus Blodgett.		Manchester, N. J.
New-Orleans & Ohio	John R. Jordan	John R. Jordan	Paducah, Ky.
New-Orleans, St. Louis & Chicago		‡‡J. D. Billings	McComb City, Miss.
New-Orleans, St. Louis & Chicago	§§L. H. Sellars		Water Valley, Miss.
New-Orleans, Mobile & Texas	H. C. Knapp	D. C. Roland	Mobile, Ala.
New-York, Kingston & Syracuse	A. Q. Mackenbush	G. Dikeman	Syracuse, N. Y.
New-York & Harlem	Wm. M. Strong	C. E. Garey	New-York.
New-York Central & Hudson River		††Leander Garey	New-York.
New-York Central Division	‡G. B. Van Vorst	D. Hoit	West-Albany, N. Y.
New-York Central Division	Henry Watkeys.		Syracuse, N. Y.
New-York Central Division	Amos Gould	James Leary.	Rochester, N. Y.
New-York Central Division	Jas. Butman	Wm. Johnson	Buffalo, N. Y.
New-York Central Division	S. L. White	George Rowe	Niagara Falls, N. Y
Hudson River Division	‡Wm. Buchanan	E. A. Olmstead.	New-York City.
Hudson River Division	R. Greenalch	J. J. Conaghty	E. Albany. N. Y.
New-York, Boston & Montreal	W. G. Van Buskirk	H. A. Webster	Dutchess Junc., N.Y
New-York & Oswego Midland			Oswego, N. Y.
Eastern Division		J. A. Read	Middletown, N. Y.
Middle Division	Tho. Howard		Norwich, N. Y.
Northern Division	Edward Van Vleck.	T. D. Day	Oswego, N. Y.
New-York & New-England	Geo. E. Boyden	Elias E. Pratt	Boston, Mass.
New-York, Providence & Boston.	Jas. H. Anderson.	Jas H. Anderson.	Providence, R. I.
New-York, New-Haven & Hartford	§§H. Kittendorf	James Denver	New-Haven, Ct.
New-York, New-Haven & Hartford	J. O. Chapman	F. Leppens	Hartford, Ct.
Northern Central	C. M. Lewis		Baltimore, Md.
Northern Central		G. W. Demarest.	York, Pa.
Northern New-Hampshire	James W. Lander.	Albert Langmaid.	Concord, N. H.
Northern of Canada	P. Clark.	P. Clark	Toronto, Can.
Northern Pacific	**H. A. Towne		St. Paul, Minn.
Minnesota Division	W. H. Lewis	W. S. Heathcote	Brainerd, Minn.
Lake Superior & Miss. Div.	G. H. Smith	John Hill	St. Paul, Minn.
Dakota Division	C. W. Rossiter		Fargo, D. T.
Pacific Division	J. F. Curtis		Kalama, W. T.
North-Carolina	Rufus D. Wade	B. G. Sergeant	Co. Shops, N. C.
North-Louisiana & Texas	C. H. Tull		Monroe, La.
North-Lebanon		Henry B. Oves	Lebanon, Pa.
North-Pennsylvania	Franklin Roop	Franklin Roop	Philadelphia, Pa.
North Eastern	D. W. Haines	A. M. Corrie	Florence, S. C.
Norwich & Worcester	Richard Colburn	G. R. Bentley	Norwich, Ct.
O			
Ohio & Mississippi		G. Hibbert	Cochran, Ind.
East Division	A. Thompson		Cochran, Ind.
West Division	H. Elliott		East St. Louis, Ill.
Oil City & Pithole	George Thompson		Pithole, Pa.
Oil Creek & Alleghany River	H. J. Bookhammer	John Monks	Oil City, Pa.
Old Colony & Newport	J. K. Taylor	A. Gleason	Boston. Mass.
Oregon & California	§§J. Brandt.		Portland, Oregon.
Owensburg & Russellville	J. R. Osborne		Owensburg, Ky.
P			
Paducah & Memphis	Alex. Forsyth		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Panama	Chas. E. Stewart		Aspinwall, N. G.
Pacific of Missouri	§§John Hewitt	E. Martin	St Louis, Mo.
Pennsylvania	§§T. N. Ely		Altoona, Pa.
Pennsylvania	H. D. Garrett	I. W. Van Houten.	W. Philadelphia, Pa.
Pennsylvania	E. L. Caum	Samuel W. Myers.	Harrisburg, Pa.
Pennsylvania	G. W. Strattan	John P. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver.	R. S. Ramsey	Pittsburg, Pa.
New-Jersey Division		David H. Baker	Jersey City, N. J.
West-Penn. Division	C. B. Street	M. H. Fales	Blairsville, Pa.
Peoria & Rock Island	Geo. Gregg		Peoria, Ill.
Peoria, Pekin & Jacksonville	R. F. Hurd	Jas. J. Doyl	Pekin, Ill.
Petersburg & Weldon	R. B. Andrews	Alex. Wright	Petersburg, Va.
Philadelphia, Wilmington & Baltimore	S. A. Hodgman	Wm. T. Worth	Wilmington, Del.
Philadelphia & Baltimore Central	S. D. Danfield	Samuel D. Danfield.	Chester, Pa.
Philadelphia and Erie	Martin Walls		Sunbury, Pa.
	W. L. Forster		Renovo, Pa.
	W. L. Holman		Kane. Pa.
	W. T. Smith		Erie, Pa.
	§§Howard Fry		Erie, Pa.
Philadelphia & Reading	L. B. Paxson	Aaron Steinbach.	Reading, Pa.
Germantown & Norris'n Div.	Jackson Richards		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis	E. Pierce		Dennison, Ohio.
Pittsburg & Columbus Division		Thos. D. Furgusen.	Steubenville, Ohio.
Little Miami Division		M. P. Ford	Columbus, Ohio.
Little Miami Division	J. H. Setchel		Cincinnati, Ohio.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlin	Columbus, Ohio.
Col., Cin. & Ind. Division	Geo. H. Prescott	Geo. H. Prescott	Logansport. Ind.
Pittsburg & Connellsville	J. E. Sampsel	J. M. Leech	Pittsburg, Pa.
Pittsburg. Fort Wayne & Chicago	S. M. Cummings	John Marquis	Allegheny, Pa.
Pittsburg, Fort Wayne & Chicago	J. M. Boon.	Israel Lee	Fort Wayne, Ind.
Pittsburg, Fort Wayne & Chicago		J. J. Kirkland	Crestline, Ohio.
Pittsburg, Virginia & Charlston	W. Lininger		Pittsburg, Pa.
Pittsburg, Washington & Baltimore	Wm. Stearns.		Connellsville, Pa.
Portland & Rochester	John G. Brady	John G. Brady	Portland, Me.
Portland & Oxford Central	Geo. W. Battles	Geo. W. Battles.	Buckfield, Me.
Portland, Saco & Portsmouth	John Donnell		Portland. Me.
Port Royal	Wm. Campbell	E. Hubard	Port Royal, S. C.
Port Hope, Lindsay & Beaverton	H. G. Taylor	H. G. Taylor	Port Hope, Can.
Portsmouth, Gt. Falls & Monmouth	James Tucker	E. Fall	Union Village, N.H.
Poughkeepsie & Eastern	John L Driscoll	Jerry Wigg	Poughkeepsie, N. Y.
Providence & Worcester	Joseph Kelly	Olney L. Smith	Providence, R. I.
Providence, Warren & Bristol	Rufus Smith	J. Brightman	Bristol, R. I.
Q			
Quincy, Alton & St. Louis	J. O. Gravell	W. G. Gilbert	Quincy, Ill.
Quincy, Missouri & Pacific			Quincy, Ill.
R			
Raleigh & Gaston.	B. R. Harding	B. R. Harding	Raleigh, N. C.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Richmond, Fredericksburg & Potomac	H. Kuhn	W. H. Trainham	Richmond, Va.
Richmond, Danville & Piedmont	John McFarland	J. B. Vaughan	Richmond, Va.
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond. Va.
Richmond & York River	C. H. Harris	J. L. Thompson	Richmond. Va.
Rive De Loup	P. A. Logan	C. R. McKinnin	Fredericton, N. B.
Rome, Watertown & Ogdensburg	Abram Klohs	H. H. Sessions	Rome, N Y.
Rome, Georgia	O. W. Harbin	O. W. Harbin	Rome, Ga
Rochester & Genesee Valley	M. E. Brown.	M. Wilder	Buffalo, N. Y
Rockford, Rock Island & St. Louis	Joseph Elder	T. F. Nolte	Beardstown, Ill.
S			
Saginaw Valley & St. Louis	W. S. Thompson		Saginaw, Mich.
San Antonio & Mexican Gulf	W. T. Bingham		Victoria, Texas.
Savannah & Charleston	P. J. Hutson	J. D. Murphy	Charleston, S. C.
Seaboard & Roanoke	§§M. M. Pendleton		Portsmouth, Va.
Selma & Gulf	Wm. T. Laughtrey.		Selma, Ala.
Selma, Rome & Dalton		W. W. Peirce	Selma, Ala.
Selma, Marion & Memphis	R. H. Anderson		Marion, Ala.
Sheboygan & Fond du Lac	John Hickey	John Hickey	Sheboygan. Wis
Sioux City & Pacific	C. H. Foster		Missouri Val., Iowa.
Southern Pacific of California	J. P. Wilson	F. N. Bellisle	San Francisco, Cal.
South-Carolina	W. B. Smith	John Reed	Charleston, S. C.
Southern Central	Chas. G. Brown.	H. Mooney	Auburn, N. Y.
Southern, of Long Island	Mark Brear	C. Wilkinson	Brooklyn, N. Y.
Southern Minnesota	James Waters		Wells, Minn.
South-Western of Georgia	C. D. Wall		Columbus, Ga.
South-Western of Georgia	D. M. Gogel	James A. Knight	Macon, Ga.
South Shore	Warren E. Ray		Cohasset. Mass.
South Side of Long Island	A. P. Doane	A. P. Doane	Williamsburg, L. I.
Spartanburg & Union	J. N. Benner	Jacob Rice	Union C. H., S. C.
Springfield, Athol & Northeastern	W. E. Granger		Springfield, Mas.
Springfield, Illinois & So. Eastern	John W. Warren		Pana, Ill.
Stanstead, Shefford & Chambly	W. H. Smith		Waterloo, C. E.
Stockton & Ione		W. T. Hoyt	Stockton, Cal.
Stonington & Providence	J. H. Anderson	J. H. Anderson	Providence. R. I.
St. Croix & Penobscot	Edward Bolton	A G. Page	Milltown, Me.
St. Joseph & Denver City	E. Sleppy		St. Joseph, Mo.
St. Lawrence & Ottawa	Calvin Dame.	Calvin Dame.	Prescott, Canada.
St. Louis, Iron Mountain & Southern.	O. A. Haynes	Oscar Doolittle	Carondelet, Mo.
Arkansas Division	L. Finlay	L. Finlay	Little Rock, Ark.
St. Louis, Vandalia, T. Haute & Ind.	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Indianapolis Division	Wm. Riley		Terre Haute, Ind.
Vandalia Division	A. J. Sanborn.		Effingham, Ind.
St. Louis, Alton & Terre Haute.	**Beriah Warren		St. Louis, Mo.
St. Louis & South-Eastern	‖L. B. Salisbury		Mt. Vernon. Ill.
Nashville Division	‖H. H. Osborne		Edgefield, Tenn.
St. Paul & Pacific	J. C. Monroe	T. W. Heathcote	St. Paul, Minn.
St Paul & Sioux City	F. C. Butterfield	J. W. Lydic	Shakopee, Minn.
St. Louis, Kansas City & Northern.	W. H. Selby	C. S. Buck	Moberly, Mo.
Sullivan & Erie			Tonawanda, Pa.
Syracuse, Binghamton & New-York	H. H. Dawson	David Burling	Syracuse, N. Y.
Syracuse Northern	W. Garrison	L. W. Smith	Syracuse, N..
T			
Terre Haute & Indianapolis	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Tennessee & Pacific	William McKeand.	William McKeand.	Nashville, Tenn.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	J. A. Hanglin		Marshall, Texas
Tioga	Peres Bonny	D. H. Stratton	Blossburg, Pa.
Toledo, Peoria & Warsaw	W. O. Hewitt	R. M. Hemphill	Peoria. Ill.
Toledo, Wabash & Western	§J. B. Morse		Fort Wayne, Ind
Toledo, Wabash & Western	‖John C. Wills		Lafayette, Ind.
Toledo, Wabash & Western	Jacob Johann		Springfield, Ill.
Toledo, Wabash & Western		U. H. Kohler	Toledo, Ohio.
Toronto, Grey & Bruce.	Wm. Bowstead		Toronto, Can.
Toronto & Nipissing	J. Haggus		Toronto, Canada.
Troy & Boston	Foster Church	R. V. Coon	Troy, N. Y.
U			
Union Pacific	§I. H. Congdon	‡‡Geo. E. Stevens	Omaha, Nebraska.
Eastern Division	‖A. M. Collett		Omaha. Neb.
Eastern Division	‖H. P. Makely		Grand Island, Neb.
Mountain Divison	‖Jno. E. Davis		Cheyenne, W. T.
Laramie Division	‖Floyd Heavaner		Laramie, W. T.
Western Division	‖C. A. Phipps		Evanston, U. T.
Utah Central	Thos. Pierpont	Thos. Pierpont	Salt Lake City.
Utica & Black River	John Bailey	David James	Utica, N. Y.
Utica, Chenango & Susquehanna	C. H. Brown		Utica, N. Y.
V			
Vermont Central	J. M. Foss	J. M. Foss	St. Albans, Vt.
Harlem Extension Div	C. S. Clapp	C. S. Clapp	Bennington, Vt.
New-London Northern Division	S. W. Dow	S. W. Caulkins	New-London, Ct.
Ogdensburg & L. Champlain Div.	William A. Short.	J. R. Ames	Malone, N. Y.
Rutland Division	N. L. Davis		Rutland. Vt.
Vermont & Massachusetts		Jacob Marsh	Fitchburg, Mass.
Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.
W			
Wash. City, Va. Midland & Gr. Southern	—— Waddy	J. T. Nalls	Alexandria, Va.
Washington & Ohio	Edward Dunn	Joshua Harrison	Alexandria, Va.

Railroad.	Master-Mechanic.	Master Car-Builder.	Residence.
Welland	James Taylor	James Chase	St. Catharine, C. W.
Westchester & Philadelphia	John Moyer	N. Pawling	Philadelphia, Pa.
Western & Atlantic	John H. Flynn	Wm. Grambling	Atlanta, Ga.
Western Maryland	Wm. Cannan	J. H. Nussear	Union Bridge, Md.
Western North-Carolina	J. D. Hollister		Salisbury, N. C.
Western R. R. N. C.	M. W. Atkinson	M. W. Atkinson	Fayetteville, N. C.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
West-Feliciana	R. C. Brower	Wm. Grawling	Woodville, Miss.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
West-Wisconsin	L. T. Mead	J. L. Adam	Hudson, Wis.
White Water Valley	A. W. Britton		Harrison, Ohio.
Wilmington, Columbia & Augusta	W. H. Turrintine		Wilmington, N. C.
Wilmington & Weldon	John Bissit	C. R. Clowe	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Wilmington & Reading	H. M. Missimer		Reading, Pa.
Winona & St. Peter	F. C. Ford	H. L. Preston	Winona, Minn.
Wisconsin Central	G. Campbell		Stevens' P't, Wis.
Worcester & Nashua	Albert Griggs.	Albert Griggs	Worcester, Mass

DIRECTORY
OF
Railway Superintendents and Purchasing Agents
THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director. ‡ Ass't. Gen. Supt. § Ass't Supt.

A

Railroad.	Superintendent.	Purchasing Agent.	Residence.
Arkansas Central	James A. Tappan		Helena, Ark.
Alabama Central	John M. Bridges		Montgomery, Ala.
Albany & Susquehanna	*C. F. Young		Honesdale, Pa.
Atchison, Topeka & Santa Fe	G. H. Nettleton	G. H. Nettleton	Topeka, Kansas.
Atchison & Nebraska	J. F. Barnard	C. C. Smith	St. Joseph, Mo.
Alabama & Chattanooga	L. J. Fleming	L. J. Fleming	Meridan, Miss.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Pittsburg, Pa.
Atlanta & Richmond Air Line	R. Y. Sage		Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	R. B. Browne	Meadville, Pa.
First Division	J. T. Odell		Meadville, Pa.
Second Division	A. L. Dunbar		
Third and Fourth Division	T. A. Phillips		Galion, Ohio.
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.
Allegheny Valley	J. J. Lawrence	J. J. Lawrence	Pittsburg, Pa.
Adirondack	C. H. Ballard		Saratoga, N. Y.

B

Baltimore & Ohio	Thos. R. Sharp	Benj. Williams	Baltimore, Md.
Central Ohio & Lake Erie Div.	Wm. Walker		Columbus, Ohio.
Baltimore & Potomac	J. N. Dubarry		Baltimore, Md.
Bangor & Piscataquis	M. H. Angel	L. H Eaton	Bangor, Maine.
Boston, Barre & Gardner	I. N. Ross		Worcester, Mass.
Boston, Hartford & Erie	H. A. G. Pomeroy		Boston, Mass.
Boston & Albany	*Wm. Bliss		Boston, Mass
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & Providence	A. A. Folsom	A. A. Folsom	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood		Fitchburg, Mass.
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A Dodge	Lyon & Vose	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood	Boston, Mass.
Boston, Lowell & Nashua	W. M. Parker		Boston, Mass.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Brunswick & Albany	C. L. Schlatter		Brunswick, Ga.
Burlington & Missouri River (in Neb.)	Wm. Irving	C. F. Morse	Plattsmouth, Neb.
Burlington, Cedar Rapids & Minnesota	W. W. Walker	S. L. Dows	Cedar Rapids, Ia.
Burlington & South-Western	R. T. Hosford		Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. H. Potter	N. M. Whitside	Corry, Pa.

C

Cairo & St. Louis	J. L. Hinkley	C. Ritsema	St. Louis, Mo.
Cairo & Vincennes	Henry L. Morrill		Cairo, Ill.
Camden & Atlantic	§F. A. Lister	J. L. Wendell	Camden, N. J.
Canada Central, Brockville, & Ottawa	H. P. Alden		Brockville, Can.
Canada Southern	*L. D Rucker		Toledo, Ohio.
Canada Southern	Webster Snyder	E. W. Porter	St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua, Pa.
Cayuga Lake	J. L. Grant		Ithaca, N. Y.
Central Branch Union Pacific	W. F. Downs	W. F. Downs	Atchison, Kan.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Central Pacific	‡John Corning		Sacramento, Cal.
Western Division	E. C. Fellows		Lathrop, Cal.
Visalia Division	E. C. Fellows		Lathrop, Cal.
Truckee Division	Frank Free		Truckee, Cal.
Humboldt Division	R. S. Matteson		Carlin, Nevada.
Oregon Divison	J. A. Fillmore		Sacramento, Cal.
Sacramento Division	J. A. Fillmore		Sacramento, Cal.
Salt Lake Division	R. H. Pratt		Ogden, Utah.
California Pacific Division	A. D. Wilder		Vallejo, Cal.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	Thos. Dodamead	J. A. Netherland	Richmond, Va.
Middle Division	H. D. Chapin		Staunton, Va.
Charlotte, Columbia & Augusta	James Anderson		Columbia, S. C.
Cheshire	R. Stewart	H. H. Stone	Keene, N. H.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt	R. W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	J. B. Mulliken		Escanaba, Mich.
Madison Division	C. A. Swineford		Baraboo, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver		Clinton, Iowa.
Western Iowa Division	John A. Head		Boone, Iowa.
Chicago & Alton	J. C. McMullen	A. V. Hartwell	Chicago, Ill.
Chicago, Burlington & Quincy	R. Harris	H. J. Higgins	Chicago, Ill.
Chicago Burlington & Quincy	‡C. H Hudson		Chicago, Ill.
Eastern and Middle Division	C. H. Chappel		Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota	C. Harris	F. I. Massey	Dubuque, Iowa.
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	*G. S. Bowen	Alfred Penny	Chicago, Ill.
Chicago & Paducah			Streator, Ill.
Chicago, Rock Island & Pacific	Hugh Riddle	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chciago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.
Chicago & Michigan Lake Shore		Wm. R. Morrison	St. Joseph, Mich.
Chicago, Danville & Vincennes	L. Pearson	C. B. Mansfield	Chicago, Ill.
Chicago, Milwaukee & St. Paul	*S. S. Merrill	—— Slocumb	Milwaukee, Wis.
Chicago, Pekin & Southwestern	W. P. Sisson		Streator, Ill.
Chicago & Canada Southern	D. Edwards		Toledo, Ohio.
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.
Cincinnati & Muskingum Valley	C. C. Wait		Zanesville, O.
Cincinnati, Richmond & Chicago	Lewis Williams		Cincinnati, Ohio.
Cincinnati & Martinsville	T. C. Burnside		Franklin, Ind.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
Cincinnati & Terre Haute			Terre Haute, Ind.
Cin., Cumberland Gap & Charleston	W. J. Taylor		Knoxville, Tenn.
Cincinnati Hamilton & Dayton	Lewis Williams	P. Hickey	Cincinnati, Ohio.
Cincinnati, Hamilton & Indianapolis	Lewis Williams		Cincinnati, Ohio.
Cincinnati, Lafayette & Chicago	E. H. Waldron	E. H. Waldron	Lafayette, Ind.
Cincinnati, Sandusky & Cleveland	Charles Howard		Springfield, Ohio.
Cleveland, Columbus, Cincinnati & Ind	E. S Flint		Cleveland, Ohio.
Indianapolis Division	C. C. Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Cleveland, Mt. Vernon & Delaware	G. A. Jones		Mt. Vernon, Ohio.
Colorado Central	P. J. Nichols		Golden, Col.
Columbus & Hocking Valley			Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H.E.Chamberlin	H. E. Chamberlin	Concord, N. H.
Connecticut River	John Mulligan	John Mulligan	Springfield, Mass.
Connecticut & Passumpsic Rivers	Geo. A. Merrill	Geo. Killey	Lyndonville, Vt.
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Corning, Cowanesque & Antrim	A. H. Gorton	R. J. Burnham	Corning, N. Y.
Cumberland Valley	I. F. Boyd	I. F. Boyd	Chambersburg, Pa.
Cumberland & Pennsylvania	J. A. Millholland		Mt. Savage, Md.

D

Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	J. R. Meckling	J. R. Meckling	Sioux City, Iowa.
Davenport & St. Paul	N. H. Wood		Davenport, Iowa.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware & Hudson Canal Co	*C. F. Young		Honesdale, Pa.
Albany & Susq. Division	H. S. Morse		Oneonta, N. Y.
Rensselaer & Saratoga Div	H. B. Smith		Troy. N. Y.
Delaware, Lackawanna & Western		G.W. B. Cushing	New-York City.
Delaware, Lackawanna & Western	W. F. Halstead		Scranton, Pa.
Morris & Essex Division	Andrew Reasmer		Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus. Division	George F. Thompson		Utica, N. Y.
Denver & Rio Grande	W. W. Borst	W. S. Jackson	Denver, Col.
Detroit & Bay City	T. B. Sargent	D. A. Waterman	Detroit, Mich.
Detroit and Milwaukee		John S. Lorimer	" "
Detroit, Hillsdale & Indiana	W. F. Parker		Ypsilanti, Mich.
Detroit, Eel River & Illinois	A. B. Southard		Denver, Ind.
Detroit, Lansing & Lake Michigan	A. H. Reese	C. D. Childs	Detroit, Mich.
Dorchester & Delaware	J. M. Murphy		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer	C. V DeForest	Dunkirk, N. Y.
Dubuque & South-Western	J. P. Farley		Dubuque, Iowa.

E

East Alabama & Cincinnati	B. Boyle		Opelika, Ala.
East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern (Mass.)		C. W. Pratt	Boston, Mass.
Erie	E. S. Bowen		New-York City.
Erie & Pittsburg	J. M. Kimball		Erie, Pa.
Erie Railway,	E. S. Bowen	Henry Bowman	New-York City.
Erie	P. P. Wright		New-York, N. Y.
Eastern Division	E. O. Hill		Port Jervis, N. Y.
Delaware Division	Benj. Thomas		Port Jervis, N. Y.
Rochester Division	M. E. Brown		Rochester, N. Y.
Susquehanna Div.	C. W. Gardner		Elmira, N. Y.
Buffalo Division	R. G. Taylor		Buffalo, N. Y.
Western Division	J. S. Beggs		Buffalo, N. Y.
Erie & Pittsburg		Wm. Mullins	Pittsburg, Pa.
European & North-American	M. H. Angel	M. H. Angell	Bangor, Maine.
Evansville & Crawfordsville	John E. Martin		Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.

F

Fitchburg	Chas.L.Haywood	John Adams	Boston, Mass.
Flint & Pere Marquette	Sanford Keeler	Geo. C. Cook	East-Saginaw, MichI
Flushing & North-Shore	I. D. Barton		Hunter's Point'L.
Flushing & North-Shore		A. E. Godeffroy	New-York City.
Fort Wayne, Jackson & Saginaw	P. B. Loomis		Jackson, Mich.
Fort Wayne, Muncie & Cin	W. W. Worthington		Fort Wayne, Ind.

G

Galveston, Harrisburg & San Antonio	Hardy Eddins	J. W. Pierce	Galveston, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Georgia	S. K. Johnson	John Vaughn	Augusta, Ga.
Gilman, Clinton & Springfield	D. H. Conklin		Springfield, Ill.
Grand Rapids & Indiana	*C. E. Gorham		Fort Wayne, Ind.
S. Division	J. M. Matheany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich.
Grand Rapids & Indiana	*W. O. Hughart	William Mullins	Pittsburg, Pa.
Grand Trunk	*J. Hickson	John Taylor	Montreal, Canada.
East Division	Henry Bailey		Montreal, Canada.
West Division	W. J. Spicer		Toronto, Canada.
Grand Tower and Carbondale	H. V. Olyphant	Wm. W. Harris	Grand Tower, Ill.
Great Southern of Ga. & Fla	M. H. Alberger		Jacksonville, Fla.
Great Western (Canada)	Andrew Watson	Robert Beatty	Hamilton, Canada.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.

H

Hannibal & St. Joseph	L. W. Towne	A. W. Lamb, W. J. Hilton, L. W. Morse	Hannibal. Mo.
Harlem Extension	F. C. White		Rutland, Vt.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin	D. S. Draper	Bridgeport, Ct.
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	W. H. Vaughan		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top.	J. McKillips	B. A. Knight	Huntingdon, Pa.

I

Illinois Central.	A. Mitchell	O. Ott	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois Midland	D. Hitchcock	‡P. Campbell	Terre Haute, Ind.
Illinois & St. Louis	W. K. McComas		St. Louis, Mo.
Indianapolis, Bloomington & Western	J. E. Gimperling		Urbana, Ill.
Indianapolis, Cincinnati & Lafayette	Geo. L. Barringer	E. V. Cherry	Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna		Indianapolis, Ind.
Indianapolis & Vincennes		Wm. Mullins	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward	J. W. Morse	St. Louis, Mo.
Indianapolis, Peru & Chicago	C. B. Robinson	D. Macy	Indianapolis, Ind.
Michigan City Division	E. C. Murphy		La Porte, Ind.
Intercolonial Railway	Lewis Carvell	Sam. Watson	Moncton, N. B.
International & Great Northern	H. M. Hoxie		Houston, Texas.

J

Jacksonville, North-Western & S. E.	E. S. Greenleaf		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	Robert Walker		Jacksonville, Fla.
Jefferson, Madison & Indianapolis		Wm. Mullins	Pittsburg, Pa.
Jefferson, Madison & Indianapolis,	Horace Scott		Louisville, Ky.
Junction & Breakwater	Wm. Groom		Lewis, Del.

K

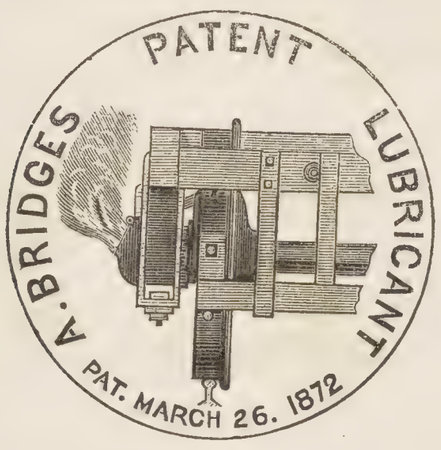
Kansas Central	W. R. Martin		Leavenworth, Kan.
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard		St. Joseph, Mo.
Kansas Midland	W. W. Fagan		Topeka, Kan.
Kansas Pacific	O. S. Lyford		Kansas City, Mo.
Kansas Pacific	O. S. Lyford	J. L. Woods	St. Louis, Mo.
Kaw Valley Division	O. H. Dorrance		Lawrence, Kansas.
Smoky Hill Division	A. B. Garner		Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col.
Kentucky Central	G. H. Pendleton	Geo. P. Bowler	Covington, Ky.
Keokuk & Des Moines Valley	Geo. H. Griggs	Geo. H. Griggs	Keokuk, Iowa.
Knox & Lincoln	C. A. Coombs	Oliver Morse	Bath, Maine.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
Lackawanna & Bloomsburg	D. T. Bound		Kingston, Pa.
Lackawanna & Bloomsburg		G. W. B. Cushing.	New-York City.
Lake Erie & Louisville	I. H. Burgoon		Fremont, Ohio.
Lake Ontario Shore	George Bennett		Oswego, N. Y.
Lake Shore & Tuscarawas Valley	W. W. Card	W. L. Holden	Cleveland, Ohio.
Lake Superior & Mississippi	G. H. Smith		St. Paul, Minn.
Lake Shore & Michigan Southern	Charles Paine	A. C. Armstrong.	Cleveland, Ohio.
Kalamazoo Division	William Wheaton		Kalamazoo, Mich.
Detroit Division			
Lansing Division			
Leavenworth, Lawrence & Galveston	B. S. Henning	Allan Bourne	Lawrence, Kan.
Lawrence & South-Western	R. B. Gemmell	R. B. Gemmell	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
		L. Chamberlin	Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa
Mahony Division	James I. Blakslee		Mauch Chunk, Pa.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	T. Hartman		Little Rock, Ark.
Logansport, Crawfordsville & S. W.	F. N. Finney		Terre Haute, Ind
Long Island	L. D. Morford	Oliver Charlick	Hunter's Point, L.
Louisville & Nashville & G. Southern	Albert Fink	G. C. Breed	Louisville, Ky.
Clarksville Division	Jas. Montgomery		Bowling Green, Ky.
Memphis Division	J. T. Flynn		Memphis, Tenn.
Nashville & Decatur Division	D. F. Whitcomb		Nashville, Tenn.
So. & North Ala. Division	Robert Meek		Birmingham, Ala.
Louisville, Cin. & Lexington	J. McLeod	E. C. McMichael.	Louisville, Ky.
Louisville, New-Albany & Chicago	John L. Day	J. R. Parker	New-Albany, Ind.
Louisville, Paducah & Southwestern	D. F. Whitcomb	D. F. Whitcomb	Louisville, Ky.
M			
Macon & Brunswick			Macon, Ga.
Macon & Western	Capt. G. I. Foreacre		Atlanta, Ga.
Maine Central	L. L. Lincoln	G. A. Phillips	Augusta, Me.
Androscoggin Division	A. Brown.		Lewiston, Me.
Manchester & Lawrence	H. E. Chamberlin		Concord, N. H.
Marietta & Cincinnati	W. W. Peabody		Cincinnati, Ohio.
Marietta, Pittsburg & Cleveland	Jas. McArthur	R. B. Hoover	Marietta, Ohio.
Marquette, Houghton & Ontonagon	*Samuel Schoch.	S. Schoch	Marquette, Mich.
Maryland & Delaware	J. L. Caldwell	J. L. Caldwell	Easton, Md.
Memphis, Carthage & North-Western	E. H. Brown		Carthage, Mo
Memphis & Little Rock	T. S. Tate, Jr.	J. D. Darden	Memphis, Tenn.
Memphis & Charleston	W. J. Ross	J. B. Galloway	Memphis, Tenn.
Michigan Central	W. B. Strong		Chicago. Ill.
Michigan Central	‡J. R. Ledyard	John Newell	Detroit, Mich.
Grand River Valley Division	C. B. Bush		Grand Rapids, Mich.
Jackson, Lansing & Saginaw Div.	C. B. Bush		Saginaw City, Mich.
Michigan Lake Shore	Chas. E. Gorham		Fort Wayne, Ind.
Michigan Lake Shore	P. S. O'Rourke		Monteith, Mich.
Midland Railway of Canada	H. G. Taylor		Port Hope, Ont.
Midland Pacific	J. N. Converse	M. A. Showers.	Nebraska City, Neb.
Milwaukee, Lake Shore & Western	H. G. H. Reed		Milwaukee, Wis.
Western Division	J. S. Buck		Appleton, Wis.
Mineral Point	G. W. Cobb	G. W. Cobb	Mineral Point, Wis.
Mineral Range	J H. Macdonald		Hancock, Mich
Mississippi & Tennessee	M. Burke	M. Burke	Memphis, Tenn.
Mississippi Valley & Western	Guy Wells.		Quincy, Ill.
Missouri, Iowa & Nebraska	Col. Henry Hill		Warsaw, Ill.
Missouri, Kansas & Texas		G. M. Babcock	Sedalia, Mo.
Cherokee Division	L. S. Hamilton		Parsons, Kansas.
Choctaw Division	S. G. Eddy		Dennison, Texss.
Missouri Division	J. J. Frey		Sedalia, Mo.
Sedalia Division	J. J. Frey		Sedalia, Mo.
Neosho Division	L. S. Hamilton		Parsons, Kansas.
Osage Divsion	C. M. Sheafe		Holden, Mo.
Missouri Pacific	A. A. Talmage	W. H. Patriarche.	St. Louis, Mo.
Missouri River, Fort Scott & Gulf	B. S. Henning	Allan Bourn	Kansas City, Mo.
Mobile & Ohio	A. L. Rives	C. E. Rushing	Mobile, Ala.
Alabama Division	Cecil Fleming		Mobile, Ala.
Mississippi Division	E. S. Hosford		Macon, Miss.
Tenn. & Ky. Divis on	G. W. Robertson		Jackson, Tenn.
Mobile & Girard	W. L. Clark		Columbus, Ga.
Mobile & Montgomery	G. Jordon	G. Jordon	Montgomery, Ala.
Montgomery & Eufaula	B. Dunham	B. Dunham	Montgomery, Ala.
Morgan's Louisiana & Texas		C. A. Whitney & Co.	New-Orleans, La.
N			
Nashville, Chattanooga & St. Louis	J. W. Thomas	L. P. Barnes	Nashville, Tenn.
Naugatuck	G. W. Beach		Bridgeport, Ct.
New-Brunswick & Canada		Tho. H. Street	St. Andrews, N. B.
New-Brunswick & Canada	John Stewart		St. Stephens, N. B.
New-Bedford & Taunton	Warren Ladd		New-Bedford, Mass.
New-Haven & Derby	E. S. Quintard		New-Haven, Ct.
New-Haven & Northampton	C. N. Yeamans	C. N. Yeamans	New-Haven, Ct.
New-Haven, Middletown & Willimantic	W. A. Waterbury	W. A. Waterbury	Middletown, Ct
New-Jersey Midland	W. E Lewis		Wortendyke, N. J.
New-Jersey Southern	*W. S. Sneden		Long Branch, N. J.
New-Orleans & Selma	T. H. Du Puy		Selma, Ala.
New-Orleans, St. Louis & Chicago	*E. D. Frost	S. H. Edgar, V. P.	New-Orleans, La.
New-Orleans, Mobile & Texas	S. N. Scranton		New-Orleans, La.
New-York & Harlem	Chas. M. Bissell	R. C. Moore	New-York, N. Y.
New-York, New-Haven & Hartford	E. M. Reed	R. N. Dowd	New Haven, Ct.
N. Y. & N H. Division	John T. Moody		New-York, N. Y.
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New-York & New-England	H. A. G. Pomeroy		Boston, Mass.
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New-York & Oswego Midland			New-York, N. Y.
New-Jersey Division	G. W. N. Custis		Jersey City, N. J.
Middle Division	H. M. Flint		Middletown, N. Y.
Western Division			Oswego, N. Y.
New-York, Kingston & Syracuse	H. P. Breed		Rondout, N. Y.
New-York, Providence & Boston	A. S. Matthews	A. S. Matthews	Stonington, Ct.
New Brunswick	Tho. Hoben	W. R. Logan	Fredericton, N.B.
Northern Pacific	*C. W. Mead	E. F. Williams	St. Paul, Minn.
Minnesota Division	J. H. Sullivan		Brainerd, Minn.
Northern Pacific Division	*J. W. Sprague		Kalama, W. T.
Lake Superior & Miss. Division	George H. Smith		St. Paul, Minn.
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North-Pennsylvania	S. W. Roberts	F. A. Cornby	Philadelphia, Pa.
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Northern Central	A. R. Fiske		Harrisburg, Pa.
Northern (New-Hampshire)	George E. Todd		Concord, N. H.
North-Eastern (South-Carolina)	F. K. Huger		Charleston, S. C.
O			
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Oil Creek & Alleghany River	C. J. Hepburn		Oil City, Pa.
Old Colony	J. R. Kendrick		Boston, Mass.
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Pennsylvania	G. Clinton Gardner		Altoona, Pa.
Pennsylvania	*Frank Thomson	Enoch Lewis	Philadelphia, Pa.
Philadelphia Division	W. F. Lockard		Philadelphia, Pa.
Middle Division	J. N. McCrea		Harrisburg, Pa.
Pittsburg Division	Rob't Pitcairn		Pittsburg, Pa.
Tyrone Division	S. S. Blair		Tyrone Pa.
Bedford Division	S. M. Prevost		Bedford, Pa.
West Pennsylvania Division	J. McCreighton		Allegheny City, Pa.
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Lebanon & Tremont	H. W. Tracy		Pine Grove, Pa.
Philadelphia and Baltimore Central	Henry Wood	Henry Wood	Philadelphia, Pa.
Philadelphia & Erie	W. A. Baldwin		Williamsport, Pa.
Philadelphia & Erie		Enoch Lewis	Philadelphia, Pa.
Western Division	J. W. Reynolas		Erie, Pa.
Middle Division	Edmund L. Tyler		Renovo, Pa.
Eastern Division	Thomas Gucker		Williamsport, Pa.
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Quincy, Missouri & Pacific	J. R. Buchanan		Quincy, Ill.
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Southern Division	Geo. L. Walker		Beardstown, Ill.
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Western Division	William E. Dorwin		Warsaw, Ill.
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Eastern Division	C. W. Bradley		Toledo, Ohio
Western Division	Robt. Andrews		Springfield, Ill.
Toledo, Canada Southern & Detroit	D. Edwards		Toledo, Ohio.
Troy & Boston	C. W. Moseley		Troy, N. Y.
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Toronto & Nipissing	J. C. Bailey		Toronto.
Tuckerton	J. Naramore		Tuckerton, N. J.
U			
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Laramie Division	S. T. Shankland		Laramie, Wyoming.
Western Division	O. H. Earll		Evanston, Wyoming.
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Utica & Black River	J. F. Maynard		Utica, N Y.
Utica, Ithaca, & Elmira	H. P. Goodrich		Ithaca, N. Y.
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Western Division	John Schrier		Ogdensburg, N. Y.
Central & Southern Division	Ambrose Arnold		St. Albans, Vt.
Northern & Eastern Division	G. L. Stone		" " "
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Washington & Ohio	R. H. Havener	Lewis McKenzie	Alexandria, Va.
Welland	William Pay		St. Catherine, Ont.
Westchester & Philadelphia	Henry K. Smith	J. J. Bryant	Philadelphia, Pa.
West-Wisconsin	W. G. Swan		Hudson, Wis.
West-Jersey	W. J. Sewell		Camden. N. J.
Western of North-Carolina	John M. Rose		Fayetteville, N. C.
Western & Atlantic	Wm. McRae		Atlanta, Ga.
Western Maryland	*J. M. Hood		Baltimore, Md.
Western Union	D. A. Olin		Racine, Wis.
White Water Valley	H. M. Britton	H. M. Britton	Cincinnati, Ohio.
Wilmington & Western	David Connell		Wilmington, Del.
Wilmington, Columbia & Augusta	James Anderson	James Anderson	Wilmington, N. C.
Wilmington & Weldon	J. F. Devine		Atlanta, Ga.
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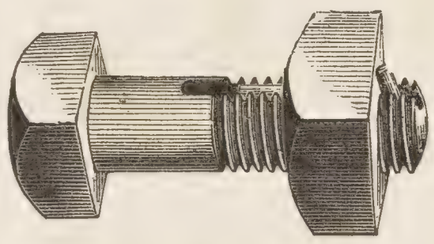
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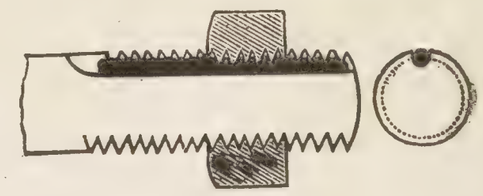
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This simple device, as will be seen by the engravings, consists of a groove being cut in the threaded part of a screw bolt into which is placed a key of copper wire, or other soft metal; when the nut is screwed on, it cuts a thread on the key, thereby making it impossible for the key to get out until the nut is taken off. When the nut is screwed up to its place, that part of the key over which the nut has passed is riveted up against the nut with a small punch, destroying the thread on the key. The nut, therefore, can not move backward until force is used, as with a wrench.

The groove can be rapidly cut with a simple machine designed for the purpose.

Experience has proved this device absolutely reliable, and it is the cheapest of all known devices for the purpose. By its use, old bolts on which the nuts have become too slack for use can be made as good as new, making it a great saving to railroad companies and others in that item alone. It is cheaper than a check-nut.

If the bolt should become slack from shrinking of timber or other causes, *the nut will always remain firmly attached to the bolt*, and, with the wrench, can be screwed up *any distance*, and the wire riveted up any number of times, or can be taken off without injury to the nut or bolt.

This is the only method in use that locks the nut firmly to the bolt without regard to place or surroundings, all others require some attachment that holds the bolt in its position, and a washer or other attachment to keep the nut from turning.

DIRECTIONS FOR USE.—Place the copper key in the slot, pointed end out, and beveled side up, in such a position that when the nut is screwed to its place about three-eighths of an inch of the key will project beyond its outer face. Then screw the nut to its place *over the key*, allowing it to cut its own thread in the copper. Then take a narrow flat set punch, and rivet the projecting part of the key *solidly* against the outer face of the nut. To tighten the nut: screw it up, and rivet the key tighter. To remove the nut: simply apply the wrench and unscrew the nut. It will cut its own way out through the copper. The same key can be used several times, by moving it outward a few threads in the slot.

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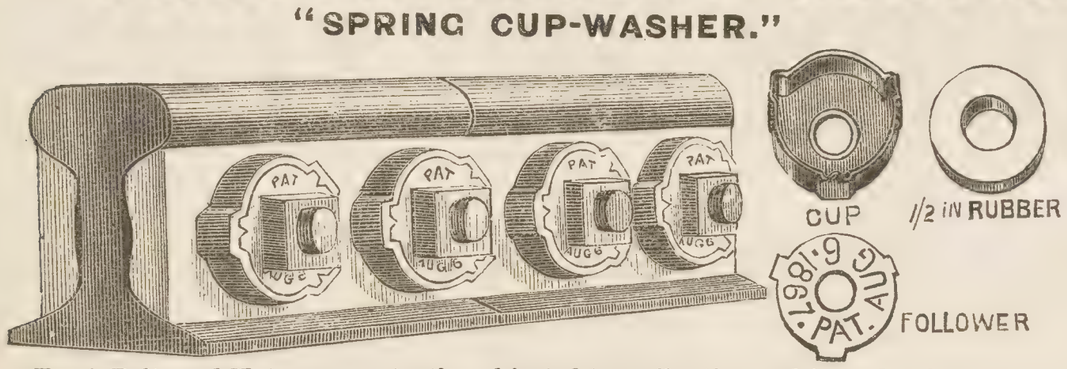
720 North Second Street, St. Louis.

32 Warren St.,

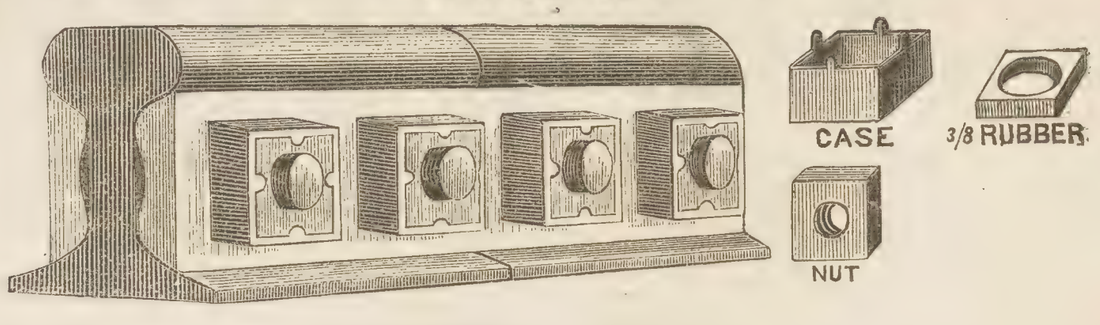
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"SPRING NUT."



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Most of the contrivances for removing this trouble are failures. They do not remove the cause of the trouble. This can only be done by some elastic material, which will absorb the vibration and prevent its reaching the nuts. Experience proves that permanent elasticity can not be obtained by using wood, which is perishable, or steel, which can not be made of uniform temper. In our inventions, the elastic packing of rubber between the nut and the plate absorbs the jar or vibration, insulates the nut, and by removing the cause of the trouble removes the trouble itself. Among its advantages are these:

1st. It saves the expense of wrench-work and loss of nuts.
2d. The rubber absorbs the blow given by the wheels at the joint, in such manner as to prevent fracture of rails at the joint, and accidents resulting therefrom.
3d. The track is made noiseless.
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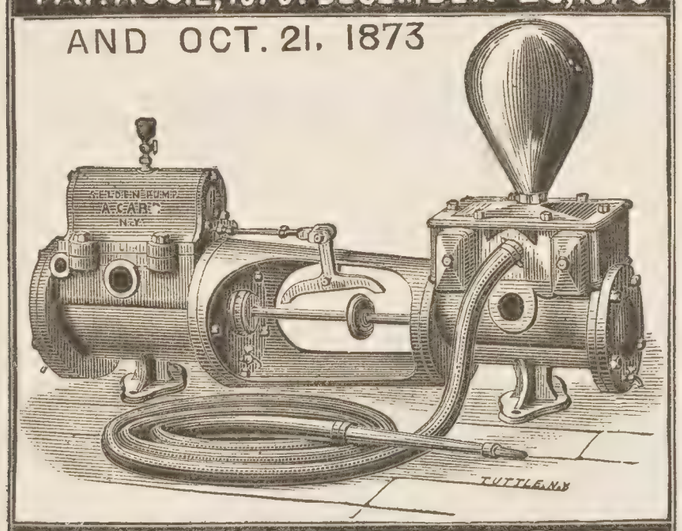
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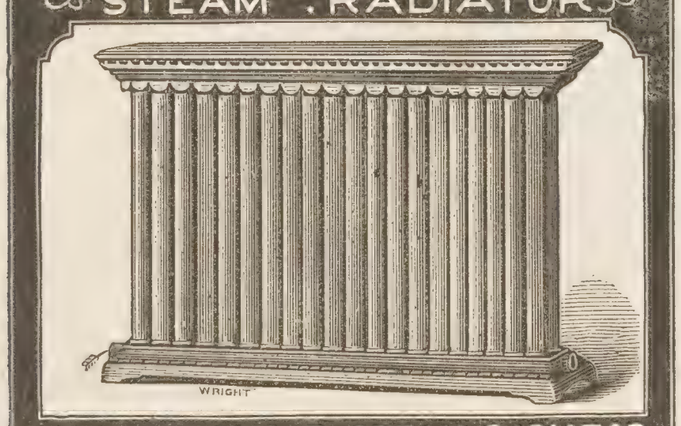
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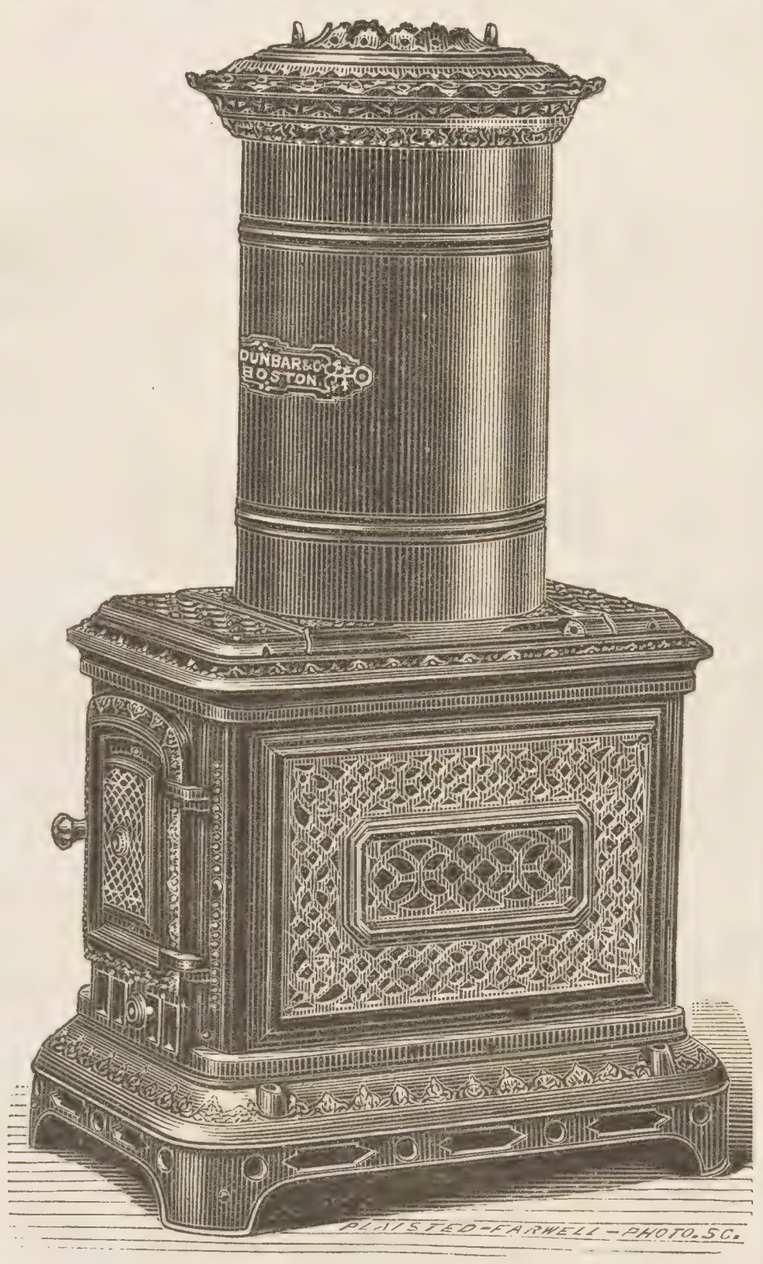
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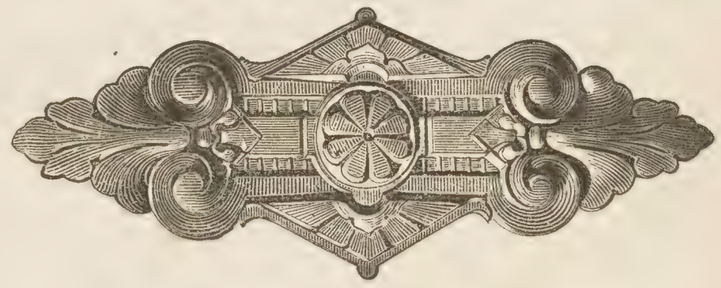
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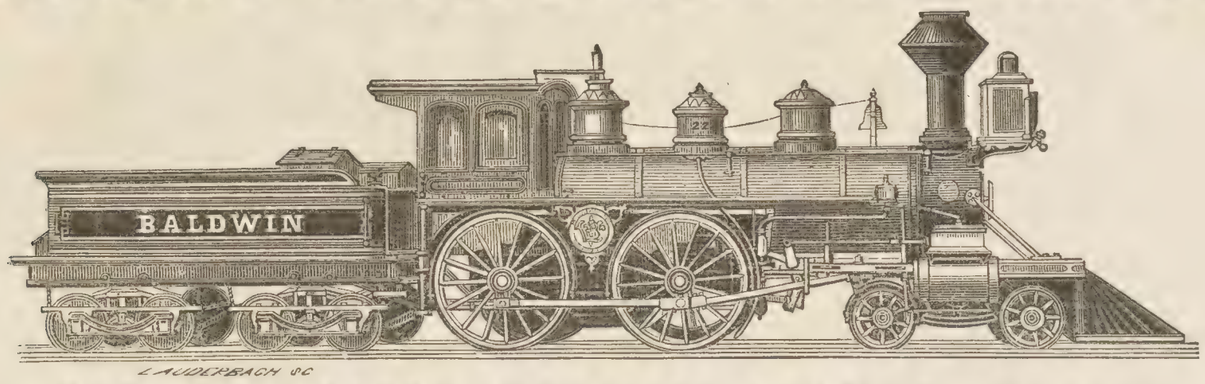
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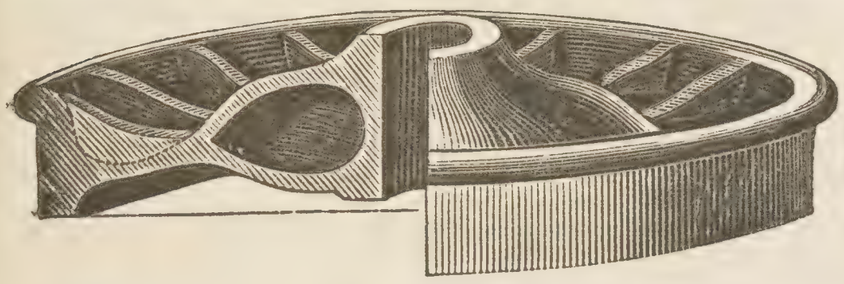
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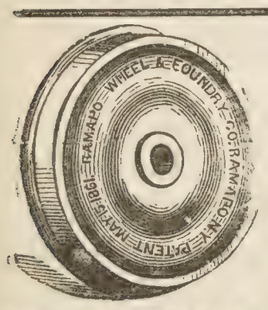
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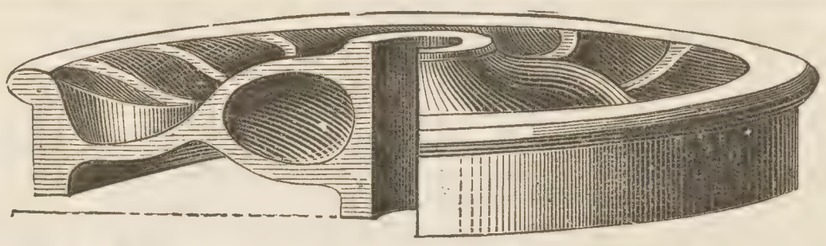
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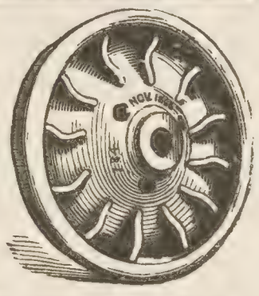
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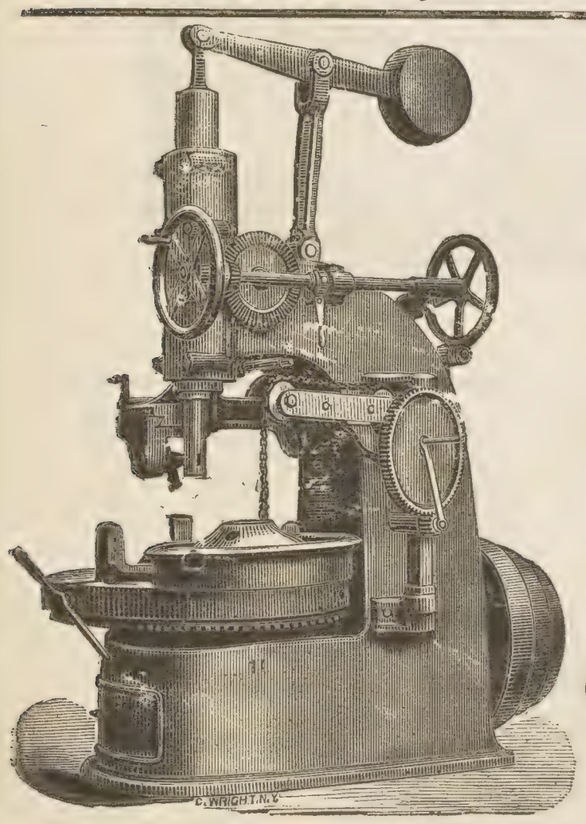
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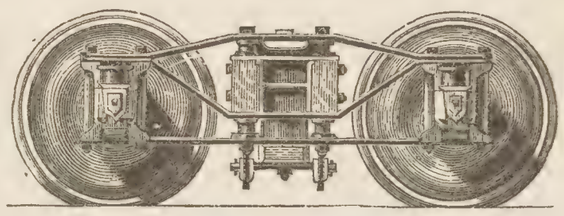
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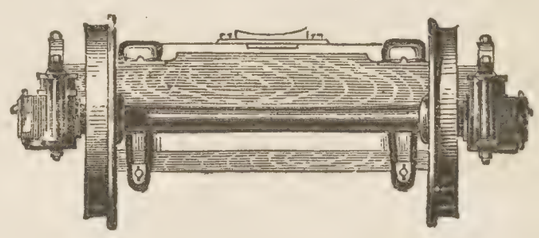
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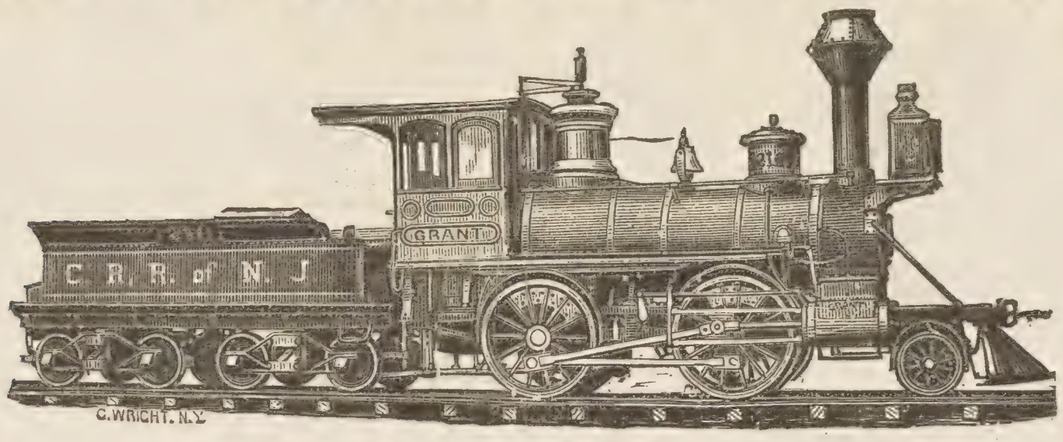
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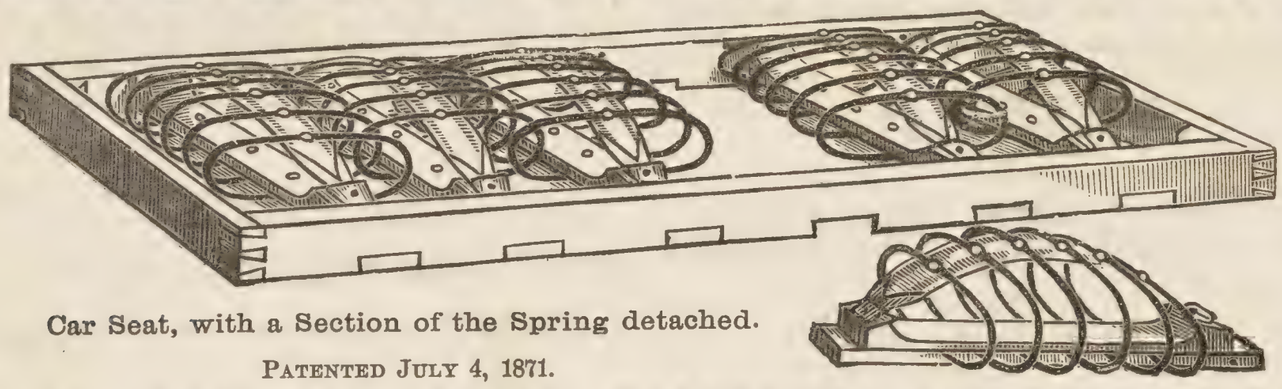
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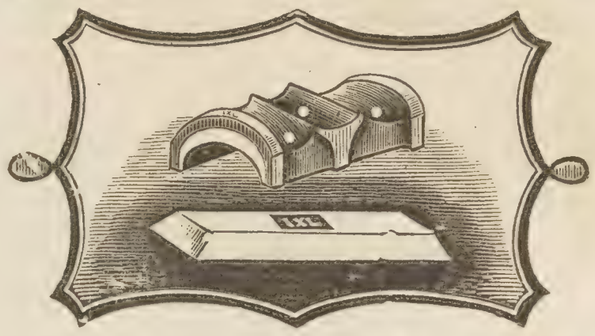
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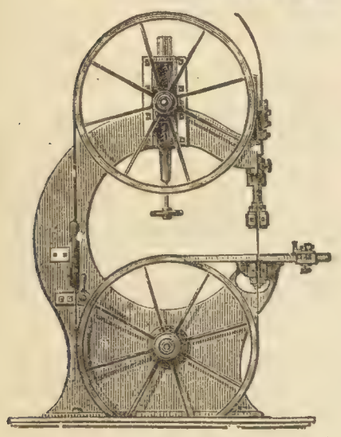
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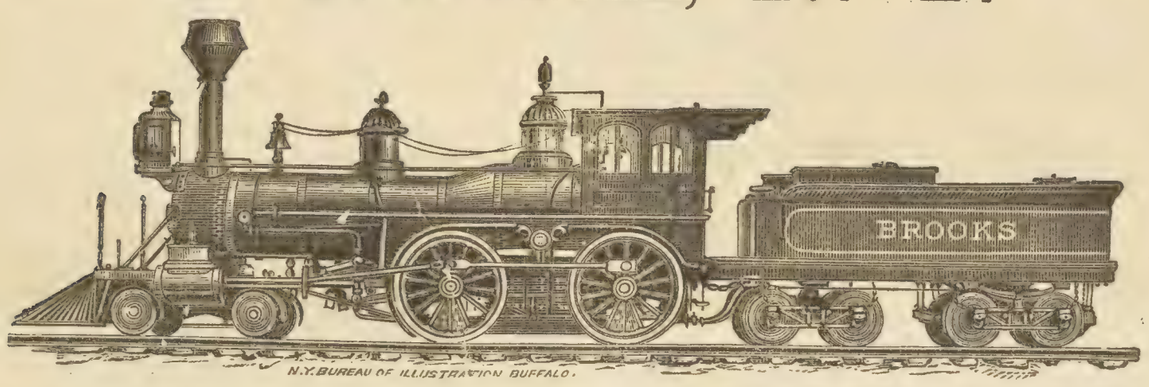
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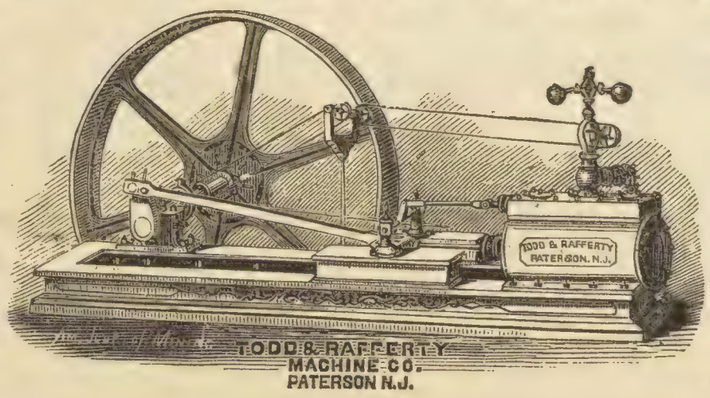
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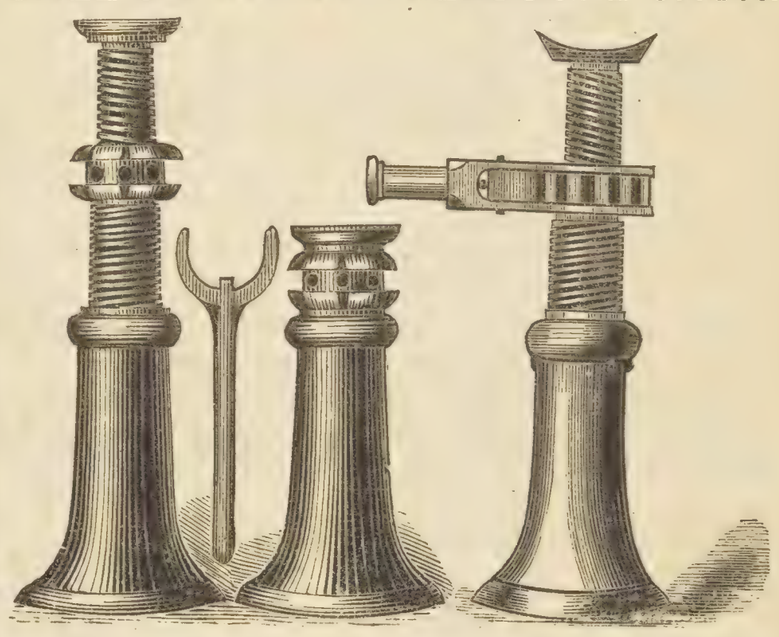
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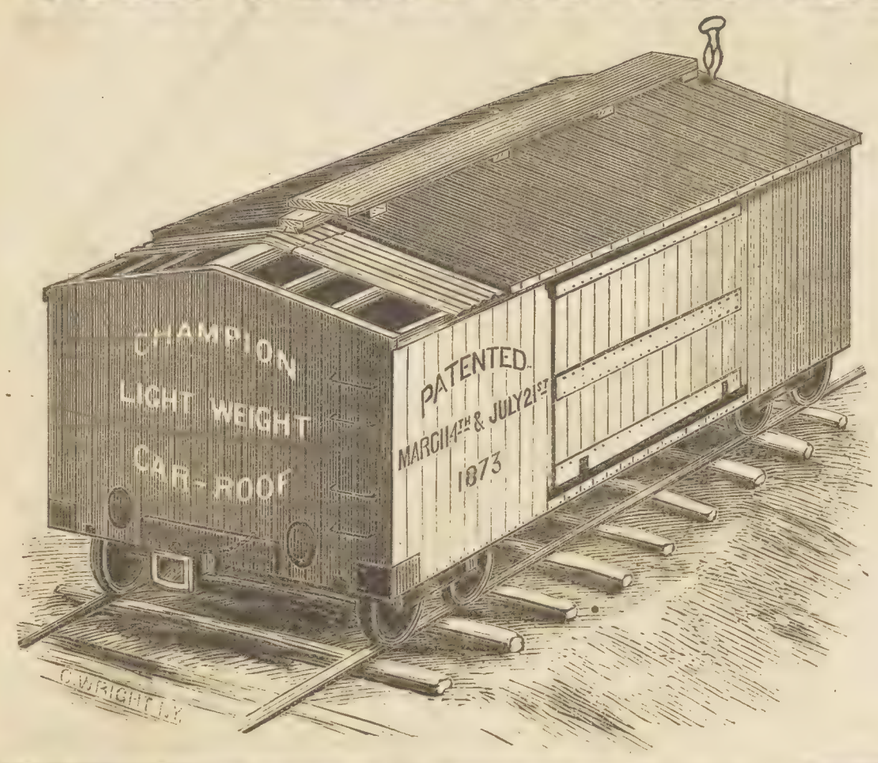
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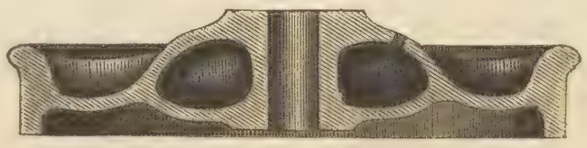
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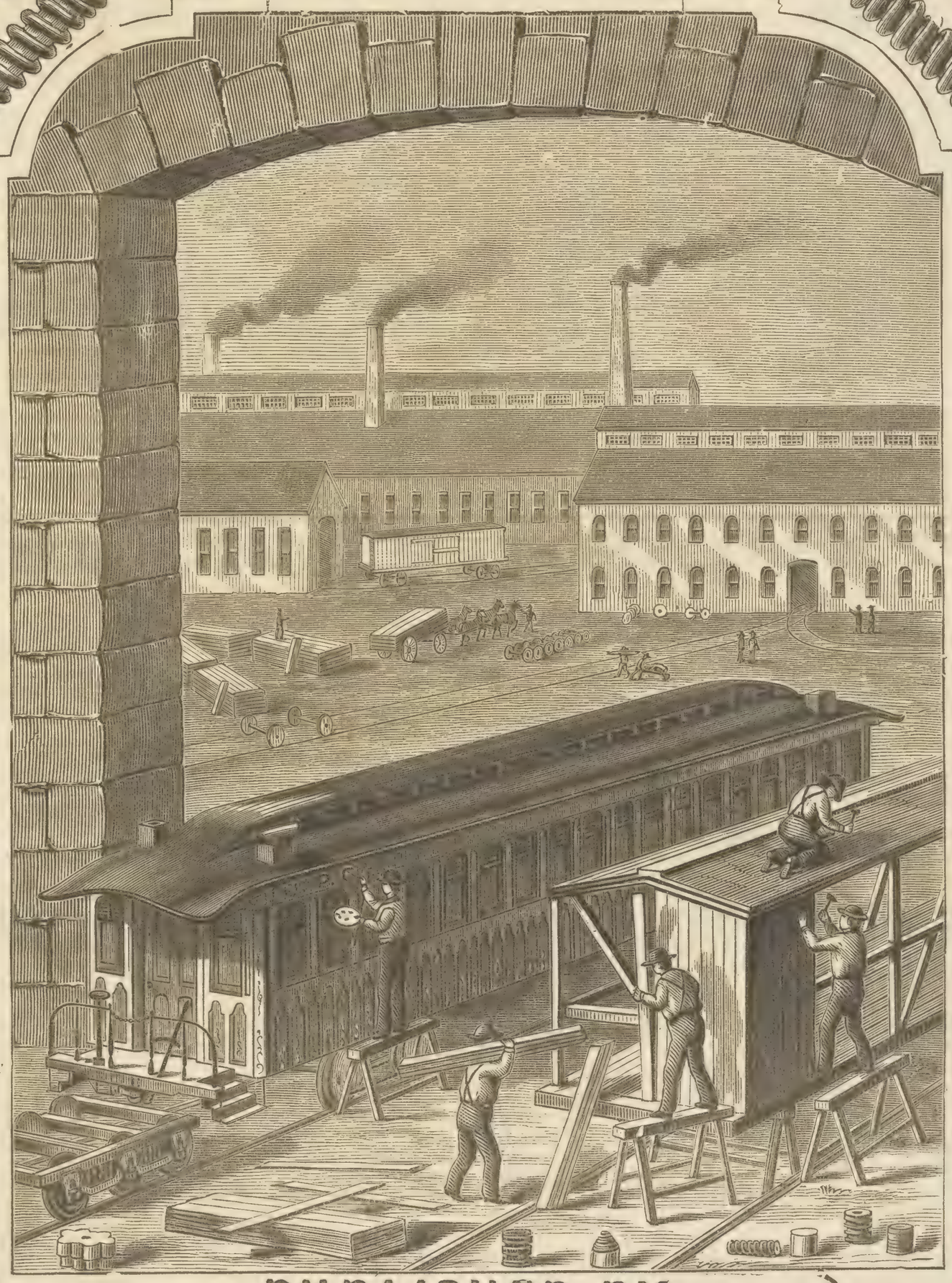
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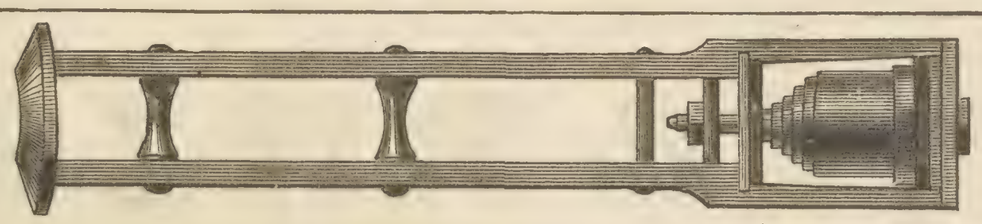
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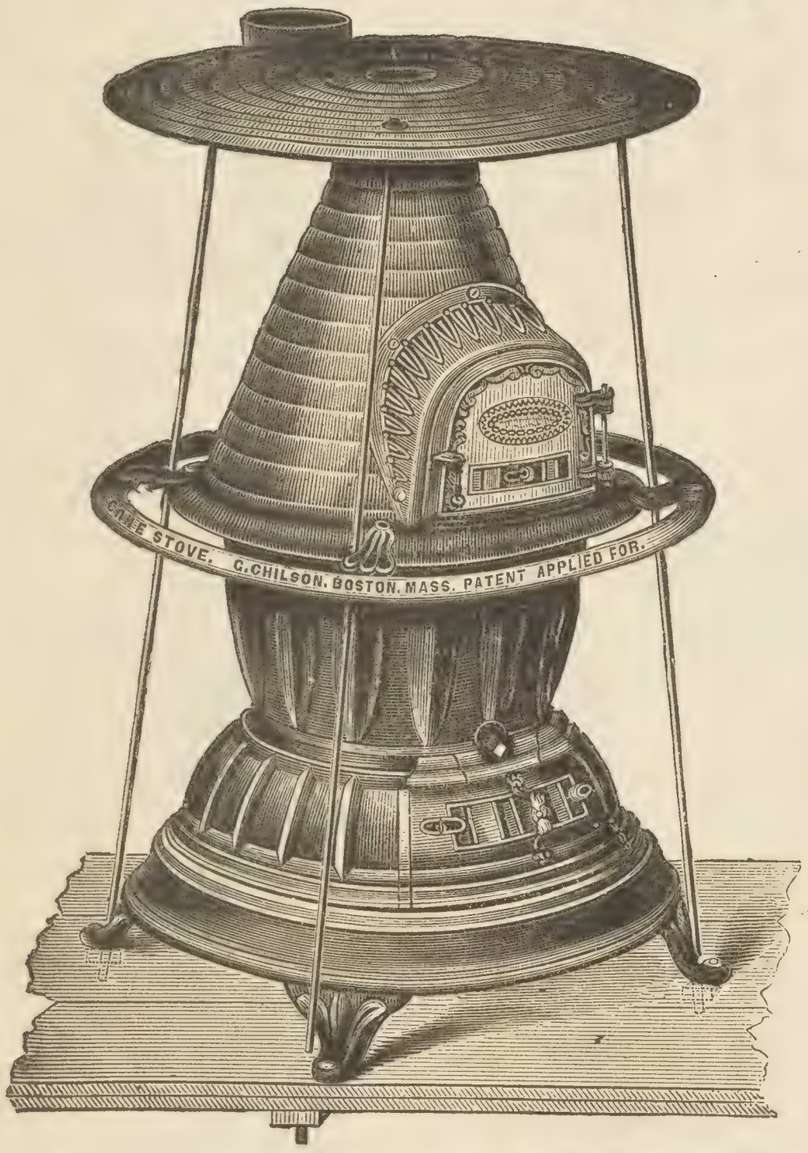
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A NEW RAILWAY CAR STOVE.

Chilson's Patent Cone Disk Stove

ON A NEW AND MODEL PLAN.



I WOULD respectfully call the attention of Railway Managers and others interested in warming Railway Cars, Station Houses, etc., to this Stove, which has been thoroughly tested on several of our railways for a few years past, and has proved in every instance the most successful plan yet devised for thoroughly warming Railway Cars. This Stove is on a new and model plan, differing in principle and operation from all others in the United States. I claim for it *Safety*, *Economy*, *Durability*, *Simplicity*, *Cleanliness, and Beauty of Design*. Its peculiar merits may be stated as follows:

1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.

2. The broad radiating disk prevents the heat from ascending to the upper part of the car or room, but distributes and throws it down to the floor, thoroughly warming the lower currents of cold air in the car or room for a great distance around the Stove, thus securing the long desired object of making the *lower part of the car and floor comfortably warm, especially for the feet.*

3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stoves.

4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.

5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*

6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories*, *Stores*, *Offices*, RAILROAD CARS, and STATION HOUSES, *School Rooms*, *Workshops*, *etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

The BOSTON AND PROVIDENCE RAILROAD COMPANY have over two hundred of these Stoves in use, and the BOSTON AND ALBANY and several other Roads are adopting them, with the most perfect success.

BOSTON AND PROVIDENCE RAILROAD CORPORATION,
Superintendent's Office, Boston, April, 1873.

GARDNER CHILSON, Esq.: *Dear Sir:* We have about two hundred of your new "Cone" Disk Stoves in use, (a part of them for nearly five years,) for warming Passenger Cars and Stations. I can truly say that they have given entire satisfaction. These Stoves possess many important advantages over any other we have ever used, viz.: for warming the floor and displacing the cold air in the lower part of the car, whereby they are rendered much more comfortable, especially for the feet, than by any other plan known to us. The Stove is more economical in the consumption of fuel, more substantial in construction, and consequently requiring less repairs than any other in use, and so securely constructed as to prevent fire from getting out of the stove even should the car be *overturned*. I cheerfully give my testimony in favor of this Stove, and commend it to all Railroad Managers. Yours, etc., A. A. FOLSOM, *Superintendent.*

Numerous other testimonials received from Railroads and other persons having these Stoves in use in Halls, Stores, etc., may be seen at office. Bolts are not required except for Cars and Steamboats.

Chilson's Improved Celebrated Cone Furnaces, for setting in Brickwork or in Portable Casings, Chilson's Unrivaled Double-Oven Brick Cooking-Range; Chilson's New and Splendid Arlington Portable Range; Chilson's very Superior Arlington Cooking Stove; Parlor, Office, and Store Stoves, Parlor Grates, Registers, Ventilators, etc.

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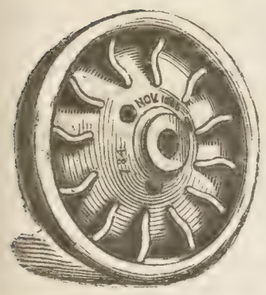
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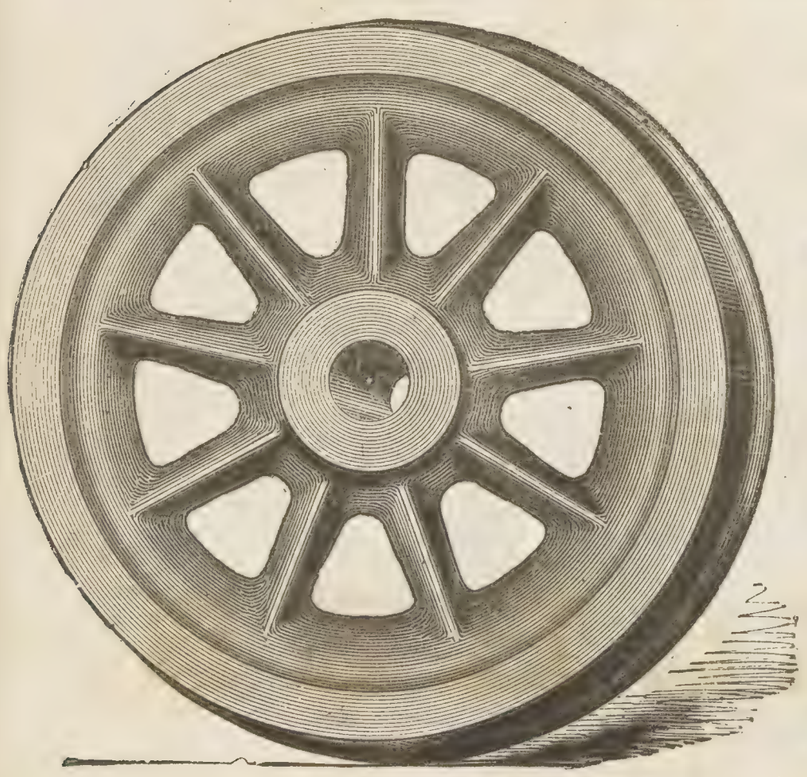
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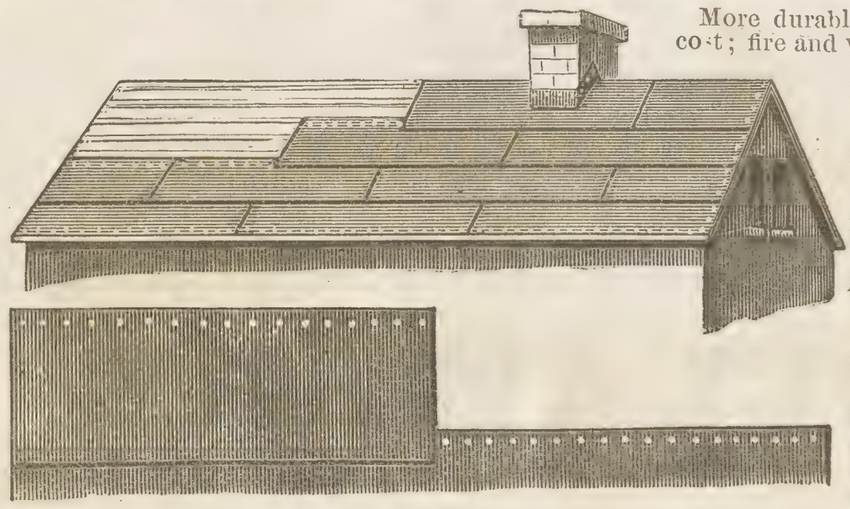
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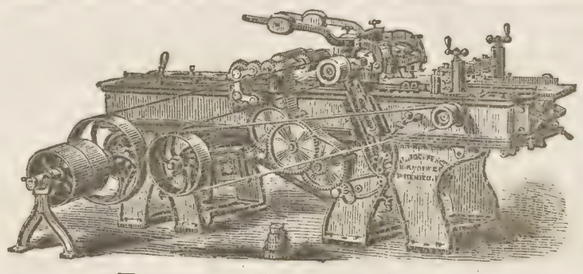
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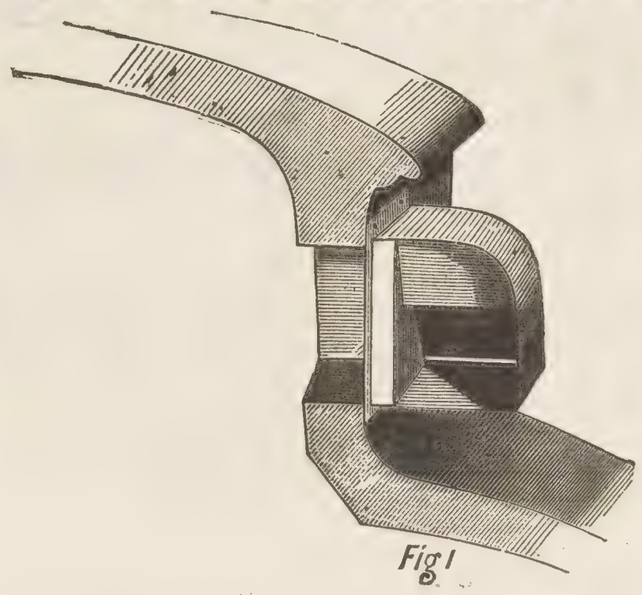


Fig 1

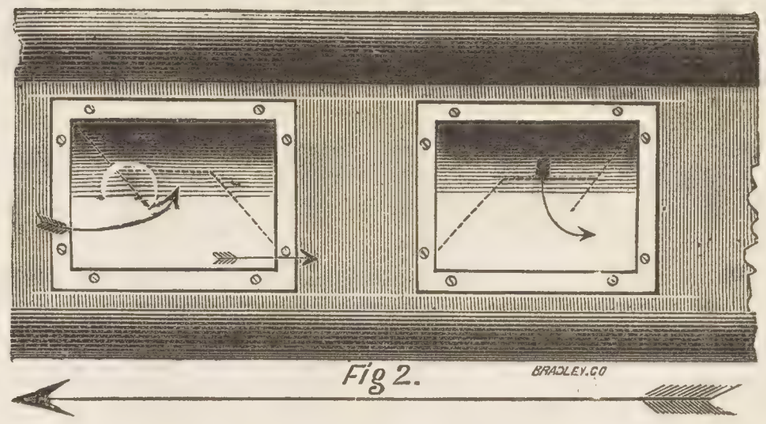


Fig 2.

THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place, it is always in readiness, and runs itself independent of all employees.

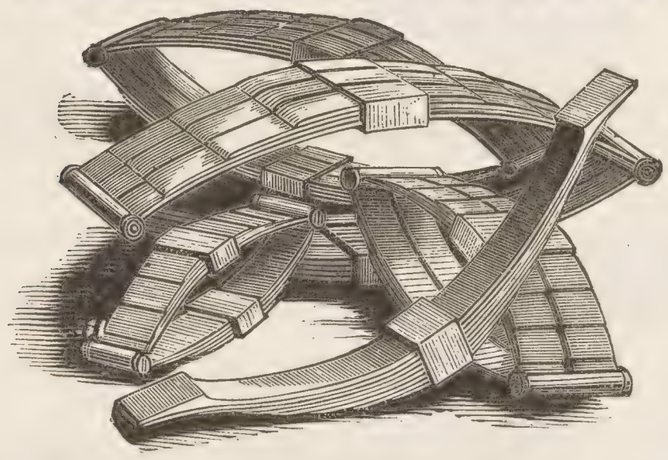
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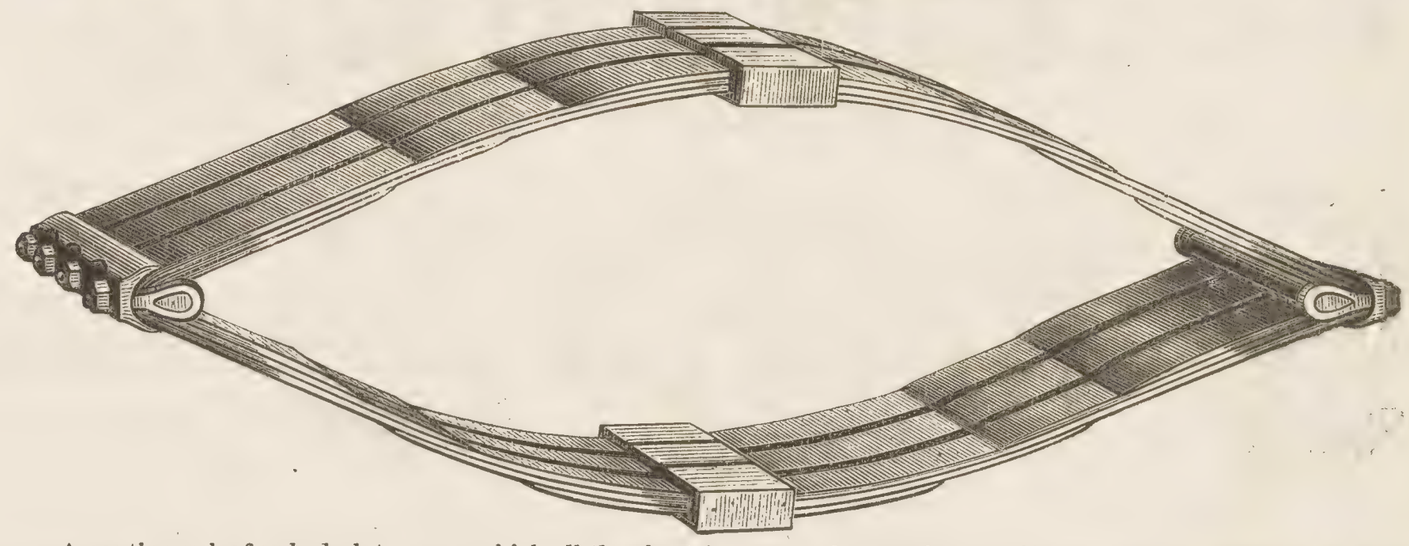
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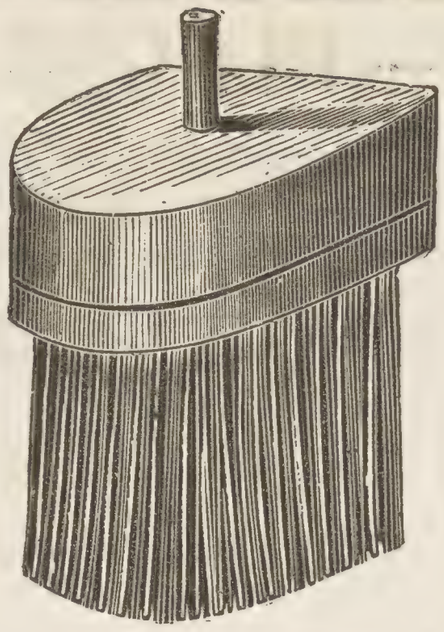
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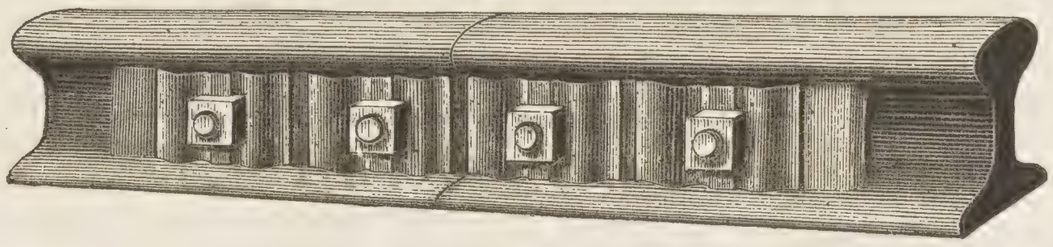
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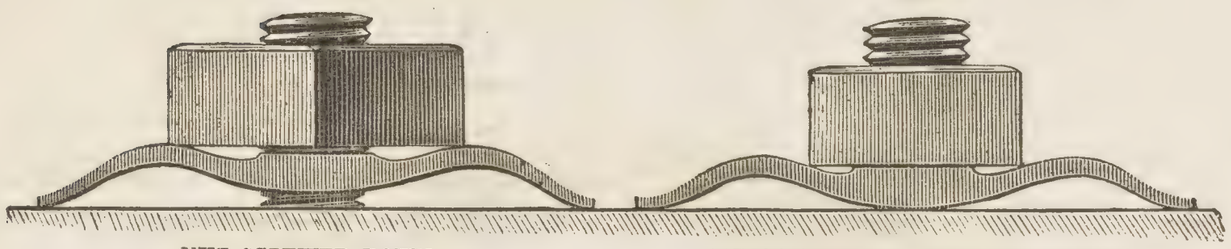


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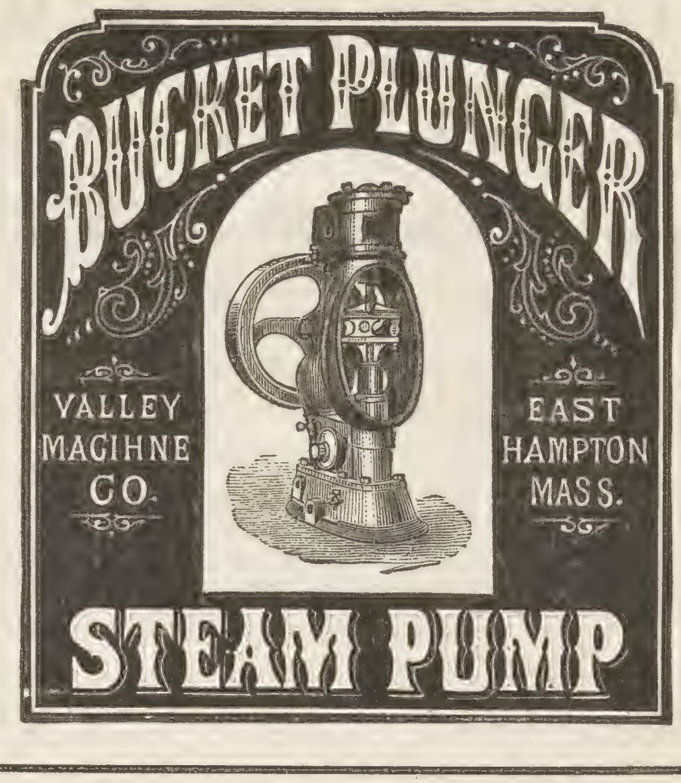




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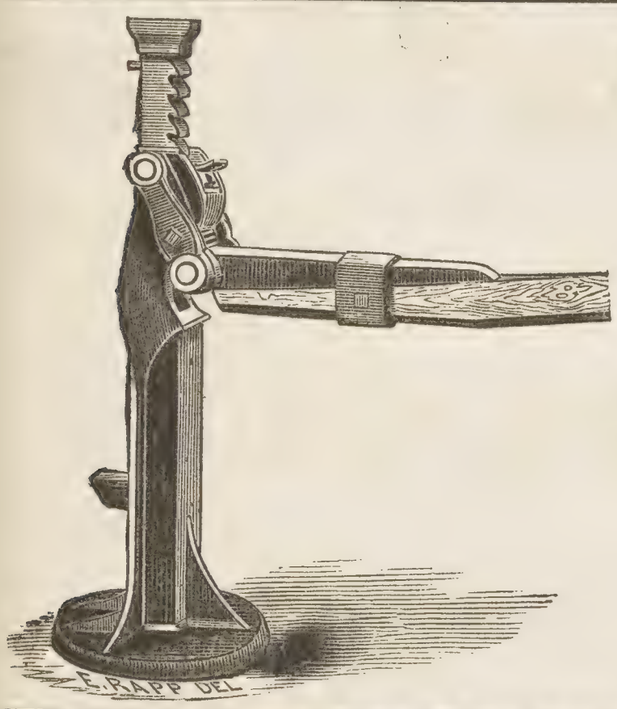
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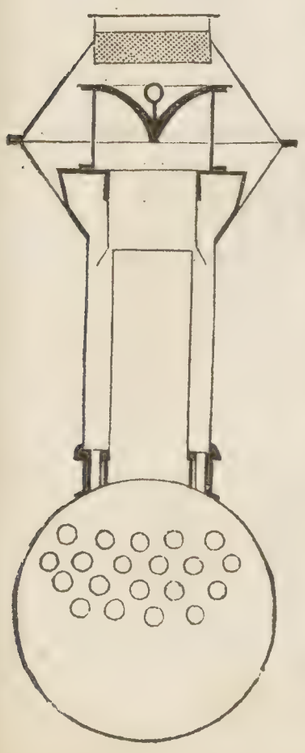
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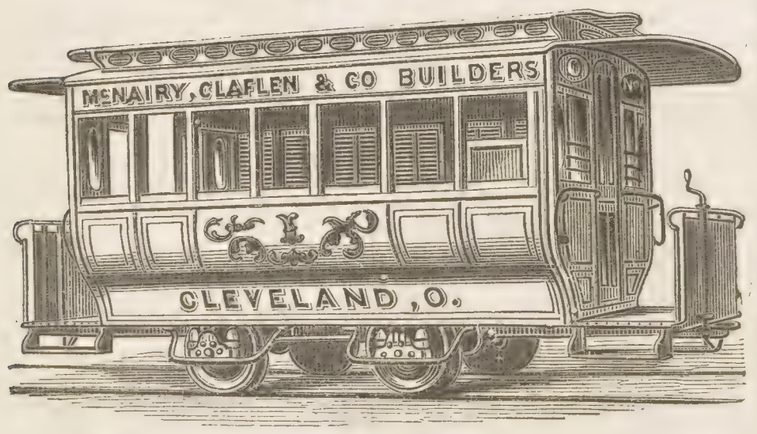
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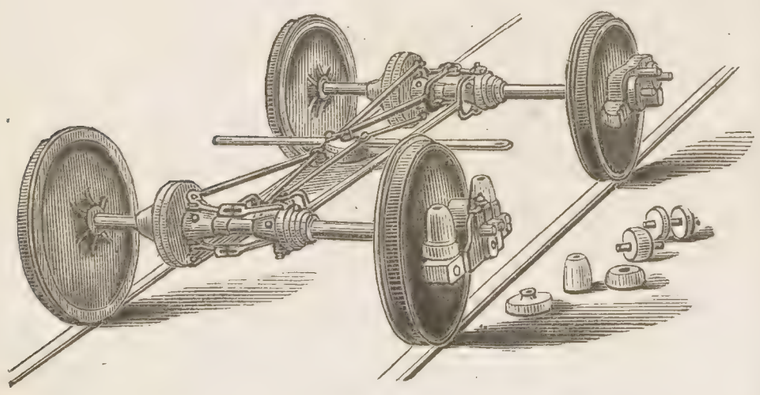
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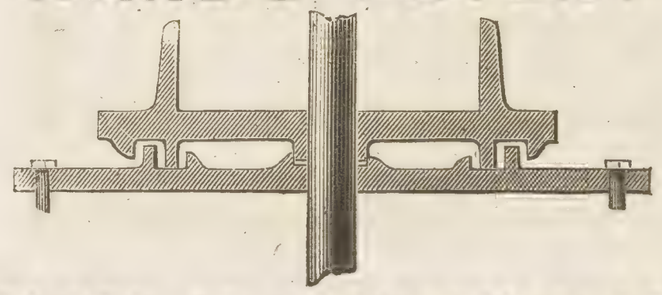
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CENTER OR TRANSOM PLATE

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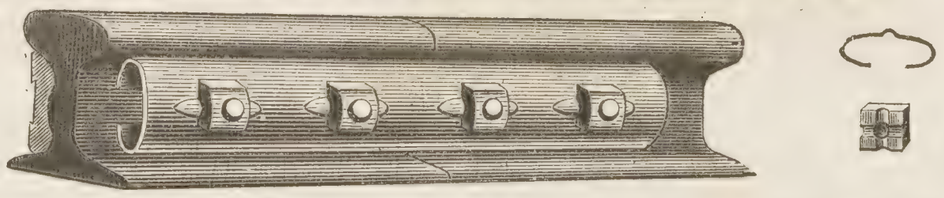
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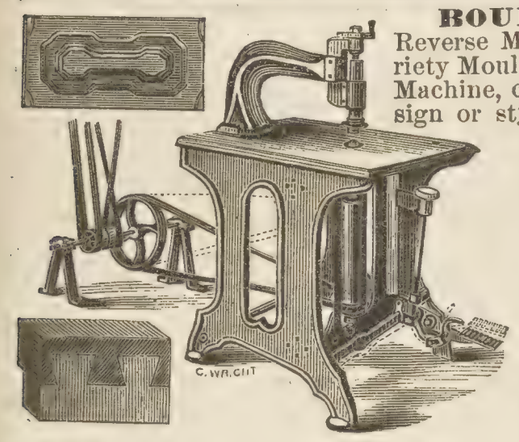
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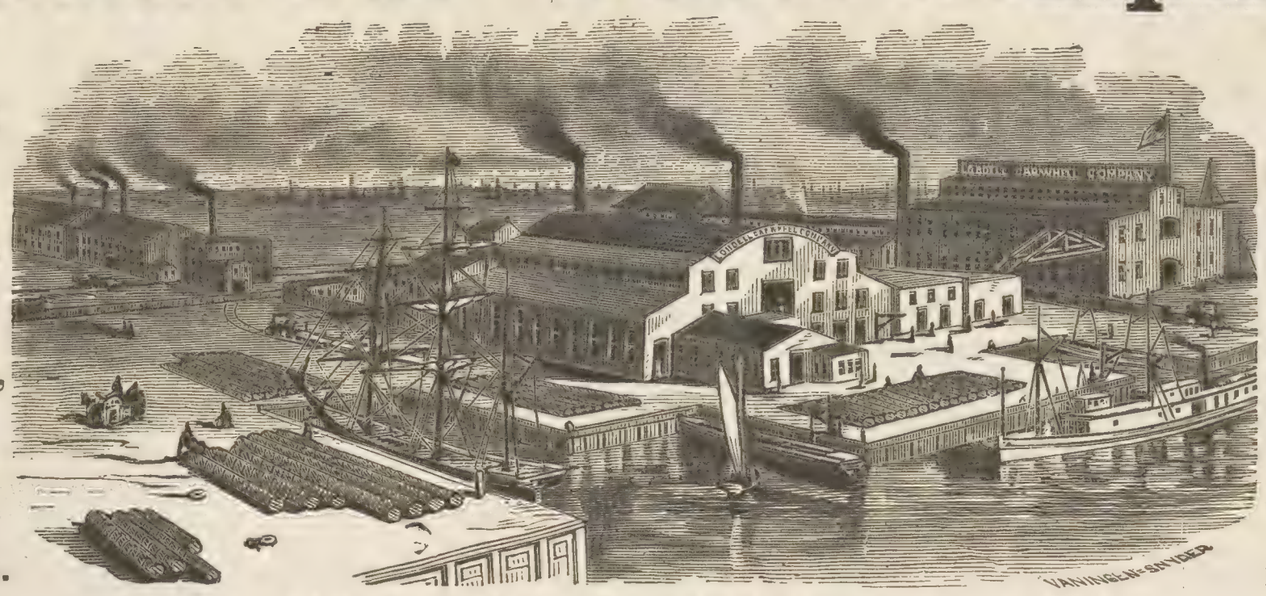
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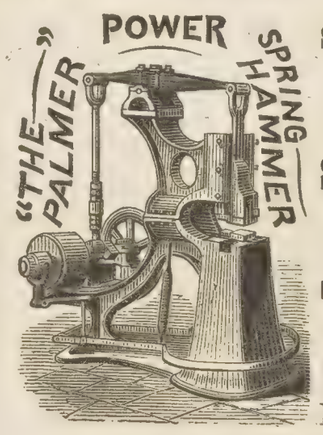
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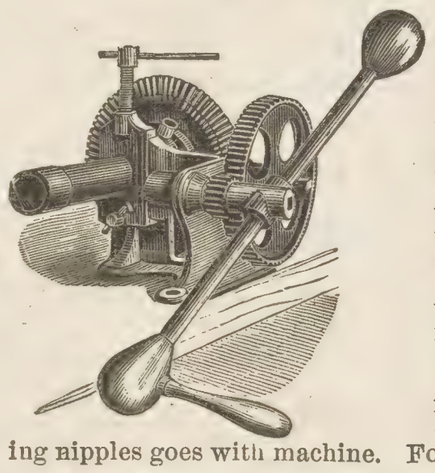
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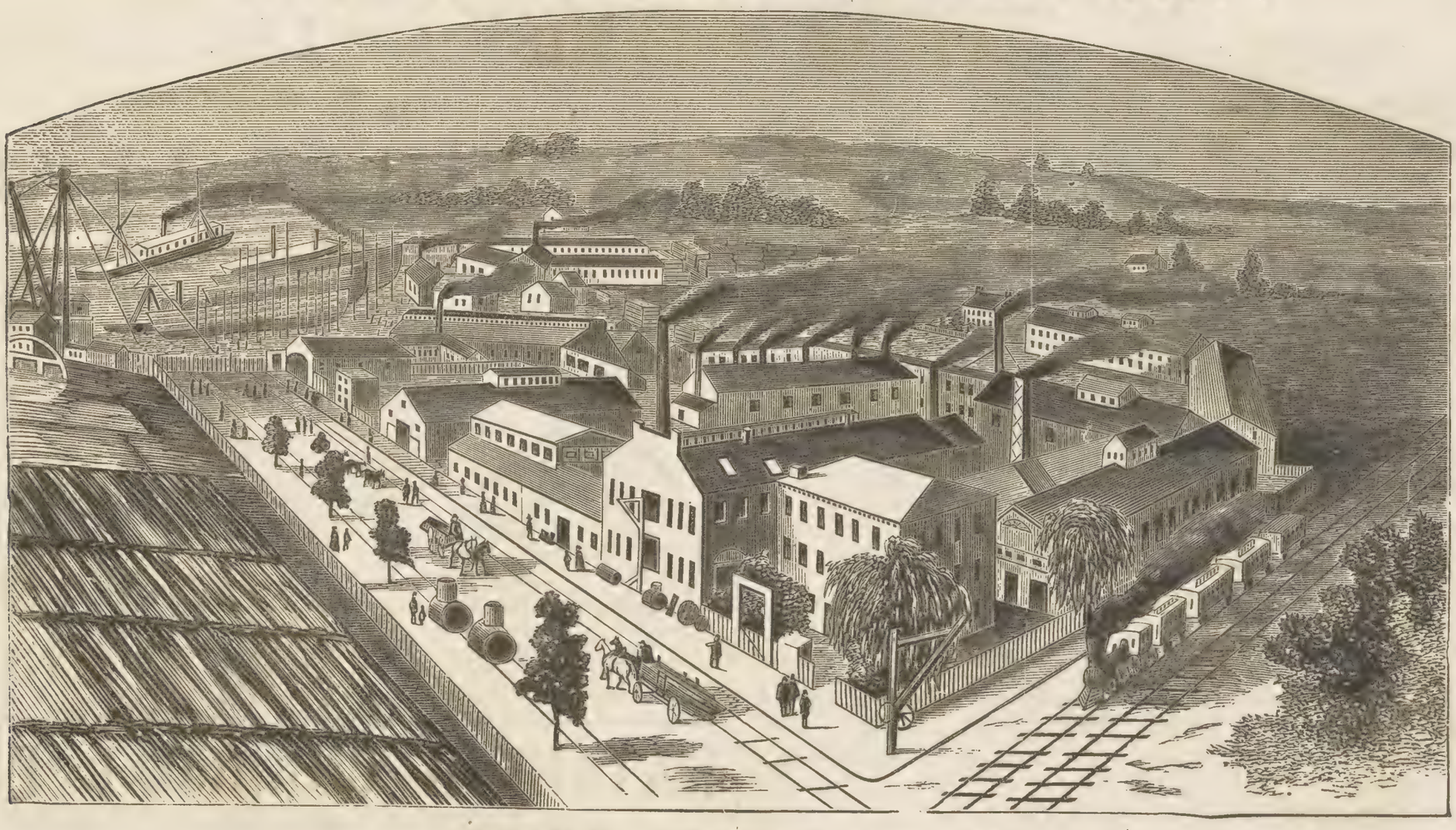
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BUILD ALL KINDS OF

RAILROAD CARS:

FIRST and SECOND-CLASS DRAWING-ROOM, SLEEPING, BAGGAGE, MAIL, and EXPRESS, BOX, and FLAT.

MURPHY & CO., NEWARK, N. J.,
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We call attention to the following prices of our Varnishes especially adapted to Railway Uses, and submit that they combine more prominently than any others, the INDISPENSABLE REQUISITES for Railway Consumption. They are of heavy body, light color, quick drying, and are guaranteed to give a maximum of durability.

Wearing Body, (For Outside Finishing.)	**$5 50**
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Japan Gold Size, (For Binding and Hardening Colors.)	**3 50**
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Black Enamel, (For Smoke Stacks of Engines.)	**3 00**
No. 1 Black, (For Iron-Work.)	**1 50**

UNIFORM SUPERIORITY IN QUALITY AND FIXED PRICES TO ALL will continue to characterize these goods, and Satisfaction in their use is assured.

THE PULSOMETER,



APPLICATION TO RAILROAD WATER-STATIONS.

The above cut represents the Pulsometer in position, supplying a locomotive tender from an adjacent stream by the use of the steam from the locomotive itself. They are fitted with flexible steam connection and adjustable delivery pipes, always ready for instant use, thus doing entirely away with the expense of water tanks, pumping engines, and local engineers at watering stations on railroads. Adapted to take water from any creek, river, or well within reasonable distance and perpendicular depth from the track. Also for filling tanks at stations it will operate with great economy and certainty, and will do away with the use of piston pumps, and all the vexations due to steam-pump engineering. Simple, durable, and reliable. Railroads equipped with water-stations complete, and warranted to give satisfaction. Send for circular.

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THE DISNEY CAR COUPLER,

Patented June 24th, 1874. Manufactured by

F. E. CANDA & CO.,
CHICAGO, ILL.

Fig. 1.

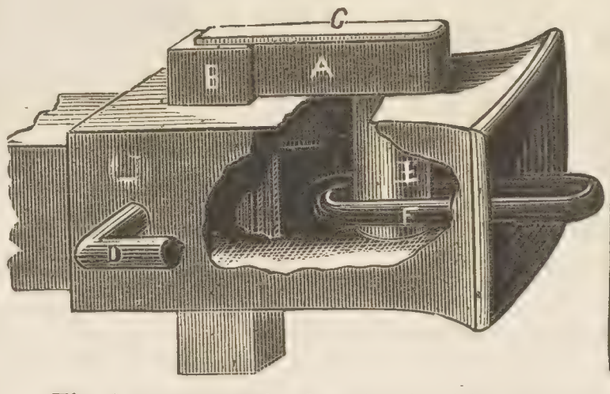


Fig. 2.

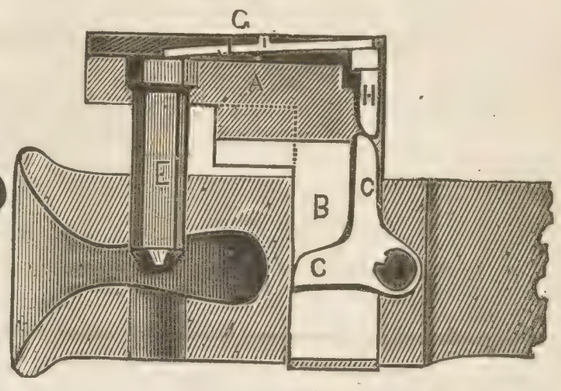


Fig. 1 represents the draw-head with a portion broken away to show the interior.

Fig. 2 represents a vertical, sectional view. *A B* we designate *The Drop*, the upper part *A* serving as the pin-holder. *D* is a lever by which the device is operated, fastened to a shaft passing through the draw-head. *C C* is a forked piece keyed to this shaft. *H* is a small loose pin. *E* is the large pin for securing the link *F*. *J* is a lever resting on the heads of pins *E* and *H*, with its fulcrum on cap-piece *G*. *Then*, when set for coupling or uncoupling, as in Fig. 2, the link *F*, in passing the mouth of the draw-head, raises pin *E*, which by lever *J* forces pin *H* against and displaces the upper arm of *C C*, allowing the *drop* to fall, carrying pin *E* with it.

From the above cuts and description it is apparent that this device combines simplicity in its construction, reliability in its working, and durability in all its parts.

We designate as points of special advantage:

That working from the side of the draw-head, it leaves no opening at the top for dirt, gravel, or accumulations of ice and snow to interfere with the working of the coupler.

That, while the link is always held in a horizontal position for entering, yet it has sufficient vertical movement to accommodate itself to cars of different heights, not exceeding a variation of six inches, without using the crooked link.

That the mouth of the draw-head is of such shape as secures the pin from all liability of bending or breaking.

That it always couples when desired, or set for coupling, and will *never* couple when not desired.

That, working readily from the top and sides of cars, there is no risk of life or limb.

That the pin can never be lost or stolen.

And further, that from its reliability of working, and durability of parts, combined with the device for securing it to passenger cars, makes *This Coupler* the safest and by far the most economical *Passenger Car* Coupler ever introduced.

The Disney Car Coupler, wherever tried or however thoroughly tried, has given the most perfect satisfaction, both as a Freight and Passenger Car Coupler.

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AND
F. E. CANDA & CO., Railroad Contractors and Car Builders,
79 SOUTH CLARK ST., CHICAGO, ILL.

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LINSEED OIL COMPANY,
Manufacturers of
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DRY AND IN OIL.
RED LEAD AND LITHARGE,
CRUSHERS OF LINSEED OIL.

ATLANTIC WHITE LEAD. PURE. WARRANTED. ROBERT COLGATE & CO.

TRADE-MARK.

Robert Colgate & Co.,
287 Pearl St.,
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O. W. DAVIS, Jr., Manufacturer, BANGOR, MAINE.

SOUTH BOSTON IRON CO.'S TESTS OF KATAHDIN PIG IRON, 1874:

	Density.	Tensile strength per square inch.
No. 2 Pig Iron,	7,2002	18,894
" 3 "	7,2432	26,928
" 4 "	7,2305	30,765

Nos. 1 and 2 are soft and strong, suitable for machinery and fine castings, boiler plates and steel. Nos. 3 and 4 are close-grained and tough, adapted for steam cylinders, radiators, locomotive castings, car-wheels, hydraulic presses, etc. All grades contain less than one-tenth of one per cent of sulphur or phosphorus. Shipped by rail or water from Bang or to any partof the country.

THE NATIONAL CAR BUILDER.

DEVOTED TO THE INTERESTS OF RAILWAY ROLLING STOCK.

Vol. VI. No. 2. | FEBRUARY, 1875. | $1.10 per Annum. Single Copies, 10 Cents.

The English Engine-Driver.

It is one of the most singular facts connected with modern literature that the deep and striking poetry of the rail and the locomotive has never yet inspired any man of genius to sing it forth to the world. Probably it is a consequence of the classical training of modern youth. Our poets get mad over the achievements of Greeks and Romans, over the Isthmian and other games, and seem absolutely blind to the fact that the things which put them into ecstasies are quite childish compared with the every-day marvels of the age we live in. No doubt "distance lends enchantment to the view;" still the Greek charioteer who, standing on a very rickety two-wheeler, whips his horses along in the Olympian races, is at best a prosaic figure when placed in contrast to an engine-driver on any of our great lines of railway. The fire-horse of our modern steam-charioteer is infinitely more majestic than the noblest stallion seen in old Greece, and the speed at which he flies through the air is, compared with that of the Isthmian games, as the eagle's flight is to the crawling of the snail. In simple truth there is scarcely any thing done by human beings that approaches in daring, in true and absolute heroism, to the hurling of an express train through space at the rate of a mile a minute and more, a speed far superior to the velocity of the hurricane. That the steam charioteer rides along safely in night and darkness, through storm and rain, on his snorting fire-horse, detracts nothing from the innate grandeur of the deed, but even adds to it. Strong and muscular, and in the full power of virile health as the engine-driver may be, he is, after all, but a dwarf handling gigantic forces, and handling them by his intellect only. The horseman with fieriest Arab steed under him has his knees and hands to govern the steed that carries him; but the rider on the locomotive is more helpless, as regards physical strength, than an infant on the back of a lion. Still, the locomotive-rider guides the flaming giant whom he bestrides as coolly and with as firm nerve as if it were a plaything in his hand. Were it not that the repetition of the daily and hourly sight had destroyed the faculty of wonder and stunted the imagination, men would look awe-struck upon the tiny individual on the back of the great machine rushing through space in a circle of flame, with a cargo of human beings harnessed behind in iron chains. As it is, familiarity has bred contempt; but notwithstanding, the fire-horse remains a marvel of marvels, and his rider a hero of the best type.

The master of the locomotive, though perhaps not willing himself to be a hero of romance, is, for all that, a very real, if quiet and unassuming, hero. There is something most manly, firm, and of the true heroic about all engine-drivers, more especially those who have seen many years of service, and are trusted with fast and express passenger trains traveling long distances. Engine-drivers of the latter class are seldom under forty years of age, and being picked men, fully conscious of the immense responsibility of their position, and accustomed to look with clear eye and unflinching nerve upon danger and death, daily braving the elements in the simple execution of their duty, they are, as a rule, singularly calm and self-possessed. Very young engine-drivers there are none indeed, owing to the long practical training through which all have to go. Before becoming the driver of a locomotive, a man must have been a fireman, or, as often called, a stoker, and most firemen again do not obtain their post without passing a previous apprenticeship as cleaners of engines, or similar occupation, in which they get a practical acquaintance, if only in the shed, with railway locomotives. It might seem that mechanical engineers, those who have the construction of engines, would make the best drivers, but experience has shown that this is not so. The requirements of the work-shop are entirely different from those demanded on the iron high-road, and frequent trials to this effect on our early lines went to show to conviction that the mechanical workmen may be, and mostly are, the very worst engine-drivers. This being so, the school of the railway servant aspiring to get a place on the board of a locomotive is entirely a practical one, and may not inaptly be compared to that which a man has to go through who wants to learn horsemanship. The study of veterinary surgery, and the anatomy of the horse, is no more required by the good rider than the art of locomotive construction by the good engine-driver; but in either case, with the fire-horse as with the flesh-and-blood horse, what is wanted is practical skill of management, largely guided by experience. It is to acquire skill by experience that the engine-driver has to come out of the fireman and, in most cases, the engine-cleaner. It is very seldom that a man is made a driver who has not been at least six years a fireman, and even then he is not put at once into regular work, but has to go through another kind of apprenticeship. The first stage of the newly-appointed driver is on the board of a pilot or shunting engine. Put in command of an engine near a station, or a goods depot, he has to haul in and out trains, which work, though requiring undivided attention and much skill, is the less responsible as being done under the eye of the superior officers, such as station-masters and superintendents. The pay of this first period begins usually at the rate of five shillings a day, advancing gradually to six shillings. When the new driver is found to have acquired sufficient skill in shunting lines of carriages short distances—which may be in a year or two, or may extend over many years—he is promoted to undertake the haulage of goods trains. His pay now is generally from six shillings to six shillings and sixpence per diem, rising occasionally a little higher, but being also sometimes a little less. Finally, this other ordeal passed, he becomes the driver of passenger trains, at first of slow or local trains, and in the end of fast trains. The pay of this highest class driver, a senior in all respects, is from seven shillings to seven shillings and sixpence per day. Seven and sixpence is the maximum on most of our smaller railways, notably those south of the Thames; but the maximum is considerably surpassed in the pay given to the most trusted engine-drivers on the great lines running northward and westward from London, and the trains of which are unsurpassed for speed and excellence. The Great Western Company give the high pay of nine shillings and sixpence a day, besides a bonus of ten pounds per annum, to a few veterans in the service, drivers of expresses. The nine and sixpence, among others, are the "compensation" of the dauntless iron-sinewed charioteers who drive the "Flying Dutchman," fastest train in the world, from London to Bristol. No hurricane that ever blew in our latitudes ever traveled at the speed of the "Flying Dutchman."

On most of our great lines of railway, the hours of duty of the engine-driver, like the hours of work of the guard, vary from day to day. The driver generally follows a time-bill under the regulations of which every week-day gives him a different train, with additional changes on Sundays, the whole so arranged that he has alternately day and night duties, and has besides about one half of the Sundays in the year for days of rest. Experience, the guiding principle in all railway management, has shown that this system is the best that can be made, and it is certain that as it works well so it gives thorough satisfaction to the drivers, more especially to those best able to form a judgment, the veterans of the service.

Considering the extremely fatiguing nature of his duties, his exposure to rain and wind and all the extremes of heat and cold, and the wear and tear of mental anxiety he has constantly to undergo, and which reaches a climax when snow and fog, his great enemies, obstruct his outlook, the work of the engine-driver is truly astounding as to its extent and amount. The average distance traveled over by the drivers of passenger trains on our smaller lines, as representative of which the South-Eastern may be taken, is 800 miles a week, or about forty thousand miles a year; but this average is far surpassed by the drivers of the great express trains on the lines north of the Thames. A careful calculation of the distances traveled by the Great Western driver whose time-bill has been analyzed, shows that in the course of one year, commencing the 4th of November, 1873, and ending the 3d of November, 1874, he hauled his trains, often at express speed, over 65,323 miles of ground, being an average of 1256 miles per week. It seems terrible work; still the veteran here referred to, upward of twenty-two years in the service of the Great Western, testifies, with many others, to the fact that the exertions gone through, great as they are, do not only not affect the health of a strong man with good nerves, but fortify his constitution, so as to harden it against age and disease. It is certain that engine-drivers, as a class, look extremely florid and healthy, and mostly younger than they really are. No doubt they get abundance of ozone into their lungs, and if they will only

stave off the enemy rheumatism by good flannel armor and temperance—the latter universal among the best drivers, not a few of whom are teetotalers—they have as much chance of living to the age of Methuselah as any of the most favored classes of the community, including country parsons. Besides, great as are the physical hardships the engine-driver has to undergo, there is some compensation for it, as for most things, in a corresponding feeling of elation, which no habit can altogether destroy, from flying through space with enormous swiftness. If Dr. Samuel Johnson held it the greatest joy of human life to travel in a post-coach with four horses at the rate of twelve miles an hour, the man who rides the "Flying Dutchman" must surely feel at times, if not always, a joy of superhuman intensity by getting through space five times as fast—at a greater rate of velocity, indeed, than any thing that ever moved on the face of the earth, except a cannon-ball. There are men of birth and education who, properly trained, act occasionally as engine-drivers—a well-known instance of the kind exists on one of our Southern lines—and they confess that there is an excitement and a charm that nothing can excel in the riding of the fire-horse. It may be said of the engine-driver as of no other mortal man, "He hath his way in the whirlwind and in the storm."
—*London Railway News.*

Paint for Iron Surfaces.

A WRITER in the *Painter's Magazine* says that the best linseed-oil, with all its advantages, is but poorly adapted to long service as a protection to iron surfaces exposed to extreme variations of temperature and to all kinds of weather; but that in selecting a paint for such purpose, mechanical adhesion is a consideration of the first importance. In this respect, paints differ widely, but it must be remembered that, in painting or varnishing a metallic surface, mechanical adhesion is all we have to depend upon. With absorbent surfaces it is different. Professor Williams gives it as his opinion, based on observation and experiment, that pitchy or bituminous films are especially effective as regards their adhesion to iron; for example, solutions of asphalt or pitch in petroleum or turpentine. These are also very effective as regards continuity, owing to the fact that, in drying, they form plastic films, which yield to the expansion and contraction of the iron, and manifest no tendency to crack. If the surface is rusty, they penetrate the oxide scale, and envelop the particles very effectually, making them a portion of the paint. The solubility of such a film in water may be counteracted by mixing it with linseed-oil. The experiment may easily be tried by mixing about two parts of Brunswick black with one of white, red, or stone-colored paint, the body of which is composed of red or white-lead or litharge. Red-lead is the best for many reasons, if finely ground and thoroughly mixed with linseed-oil. Any one of several kinds of bitumen may be used, either natural mineral asphalt, pine-pitch, or artificial asphalt, such as gas-tar or the residuum of petroleum distillation in cases where the crude oil has been distilled before being treated with acid. This gives a very hard, bright pitch, which is soluble in "once run" paraffine spirit, and which makes the base of an excellent, cheap, and durable paint for iron-work in exposed positions.

During the past few years, the writer has heard many accounts of the preservative influence of paraffine when applied to iron surfaces, and can recommend it for all classes of iron-work which can be treated hot. The most effective method of applying it is to heat the iron *in vacuo*, in order to expand it and open its pores, when paraffine, raised to the proper temperature, is run upon it. By this means, the iron is penetrated to a sufficient depth to afford a very effectual protection against oxidation, especially when a suitable paint is subsequently applied. Any non-oxidizable substance would probably answer, but paraffine is as cheap as any, and quite as good if not better, the only exception as to quality being made in favor of some kind of vitreous enamel, which, while costing more, would certainly be more permanent in its benefits. Brushed upon the outside merely, it is doubtful if paraffine would have much effect in preserving the iron, while it would certainly tend to lessen, if not destroy, the mechanical adhesion of a surface paint. There is no reason, however, why bridge-work, iron fronts, etc., should not be treated with paraffine before they leave the shops where they are made, which would greatly simplify the problem of their easy and economical preservation from oxidation. In the absence of such treatment, a careful coating with the paint above described will probably prove the most effectual means of protecting iron surfaces.

A Pennsylvania Sunday-Law Decision.

JOHN CONWAY, an employee of the Pennsylvania Railroad, was convicted in the Common Pleas Court of Juniata County, in September last, of violating an act passed in 1794, by coaling locomotives on Sunday at Patterson station, which locomotives were drawing trains loaded with cattle and hogs which had left Pittsburg the day before. The record was brought before Judge Kreider on *certiorari*, and the judgment reversed. In rendering this decision, the Judge refers to the fact that over 2000 head of live stock were on the trains, that there were no stock-yards at Patterson capable of accommodating such a quantity of cattle, and no provisions for feeding or watering them in the cars. For the trains to stand still over Sunday would be worse for the animals than to go on, as the motion was a diversion and made them less restive. Under these conditions, he did not consider the defendant liable under the act aforesaid, as it made an exception in favor of works of "necessity and charity." The word necessity, in its comprehensive signification, should be construed to meet all the requirements of this progressive age; and had these ancient lawmakers been permitted to see the future and realize a graded iron road from ocean to ocean, with its tens of thousands of vehicles, and its ponderous engines moving with tireless energy night and day, with miles and miles of valuable products *en route* for the great central marts of trade, and with armies of travelers at every point of the vast thoroughfare, it is hardly to be supposed that they would have asked this stream of life to halt at midnight and remain stationary until Sunday had passed, any more than they themselves would have been willing to forego their daily allowance of milk and dressed victuals. What the defendant did was clearly a matter of necessity and charity, by permitting the suffering brutes to pass on their way to a place of relief and safety.

American Yellow and Pitch Pine.

WE take the following from an address by Mr. J. G. Tynde, president of the Manchester Scientific and Mechanical Society England: "The next class of timber to which he would direct their attention was the American yellow pine. This timber was imported in logs, and cut up into boards or scantlings in this country; like the white wood, it was practically non-resinous; it was of a fair texture, and when not exposed to damp was durable. It was much used for building purposes, especially for joiners' work that was covered with paint. As a bearing timber it had a peculiar quality—viz., that it retained its form with a permanent load; whereas many kinds of timber when loaded continued to deflect for years, although the load might not be greater than they might safely be required to bear. Unless, however, this wood was properly treated from the log, its valuable quality of retaining its form was materially impaired. The log should be cut into boards in the autumn, and exposed to the weather through the winter; in the spring it should be removed into the drying shed, and thence into a room having a corresponding temperature with that wherein it was to be stored when finished, for at least one month before being worked. On no account should this wood be placed in a stove, as in its removal from a higher temperature it would always be liable to change its form. There were many qualities of yellow pine, and their quality varied very considerably. Next, referring to the red wood, he said this timber was imported both from America and the Baltic in the form of both logs and deals. There were several varieties of red deals, each possessing its own peculiar character; but all of them more or less valuable on account of their power to resist atmospheric changes and the action of moisture. It was, therefore much used in engineering works for piles and timber framing exposed to the weather, railway sleepers, and all places where it was necessarily shut out from a free passage of air. It was also less liable than any other kind to dry-rot. The timber imported from Sweden was generally of a very inferior quality and of small size; it was very liable to crack if exposed to the sun, causing what were known as 'sunstrokes.' The custom at all the ports on the arrival of the timber was to put the logs into water to prevent this. The pitch pine imported from the Southern States of North-America, Georgia and Florida, was of a strongly resinous character, but had a great tendency to dry-rot, especially if it was placed in contact with fresh mortar and lime. This timber was, therefore, unfit to be built into walls as bearing beams, unless the ends were placed in cast-iron boxes, or were otherwise protected so as to allow a free circulation of air round the ends of the beams. Many samples of this timber had, a beautifully waved grain, and would take a high polish, and these were selected and used for ornamental joiners' work 'One peculiarity in connection with all red wood was, the varied qualities found in the same log; the lower part of a tree might be exceedingly good, while the upper part might be very inferior. From the remarks he had made, it would be seen how impossible it was to fix any arbitrary formula, that would be applicable for calculating its strength the quality being so variable the same formula would not apply in any two cases. He had tried some experiments on a sufficiently large scale to guide his own judgment, and he found that for a very good and selected sample of Baltic timber the following simple formula for beams might be relied upon: The breaking weight in the centre equaled the product of the breadth with the square of the depth multiplied by 15, and divided by the length in feet; and for an ordinary sample of timber he usually took the safe load in the centre in tons equal to the product of the breadth, with the square of the depth multiplied by .03, and divided by the length in the feet."

A RUSSIAN engineer has invented a kind of differential gauge for railways, which is said to work admirably on several of the Russian lines. It consists of a beam about five feet long, provided at one end with an articulated lever, on the shorter arm of which is a stud that presses, by means of a spring, against the inner face of one of the rails, and at the other with a fixed stud—the beam being drawn along the rails by a man by means of shafts, or it may be attached to a truck. As the gauge proceeds along the line, the deviations from the normal width between the rails are shown by the longer arm of the lever, which moves against a dial-plate. The apparatus is quite inexpensive, and its superiority over the common gauge is said to be very striking, especially as regards the rapidity and continuity of the action.

THERE is supposed to be iron enough in Missouri to supply the whole country; in one deposit alone there is estimated to be over 14,000,000 tons of the ore; elsewhere there are 230,000,000 tons, or enough to build 2,000,000 miles of railroad. That State is also exceedingly rich in lead, tin, zinc, copper, and other minerals of value.

THE Baltimore and Ohio Railroad Company have secured the Exposition building at Chicago, for a depot.

The Decline in Mechanical Skill.

TWENTY-FIVE years ago surfaces of wood were made smooth and exact by a plane in the hand of a mechanic. The same is true in surfaces of metal, except that the instrument used was a file or a chisel Great works were impossible, except at a heavy cost; and a contract that would be a mere trifle in these days was a serious undertaking, for it involved calculations as to the number of men who had sufficient manual dexterity to be intrusted with the work. In reducing the valve-seat of a steam-engine, for instance to a plane surface, a few too heavy blows on the chisel would render additional labor necessary, adding much to the cost.

The circumstances of those times produced good, workmen. They make mechanics in every sense of the word, men of ample experience and high intelligence, familiar with all branches of their business, and able to execute one detail or the other with equal facility.

Through the introduction of automatic machines, which only require to be set in motion to produce certain forms, manual dexterity is no longer a prime requisite, and, as a consequence, versatile mechanics are scarcer every year. A prominent man remarked to us recently: "I can take all the so-called carpenters in this town, and out of the hundreds find a dozen, perhaps, worthy of the name; a dozen who understand their calling in all details, and can estimate for a contract." Persons having work done in country towns may be able to verify this statement from their own experience. Work which was to have cost a certain sum has exceeded it enormously. The reason is in the fact that the men were ignorant of their business and guessed where they should have calculated.

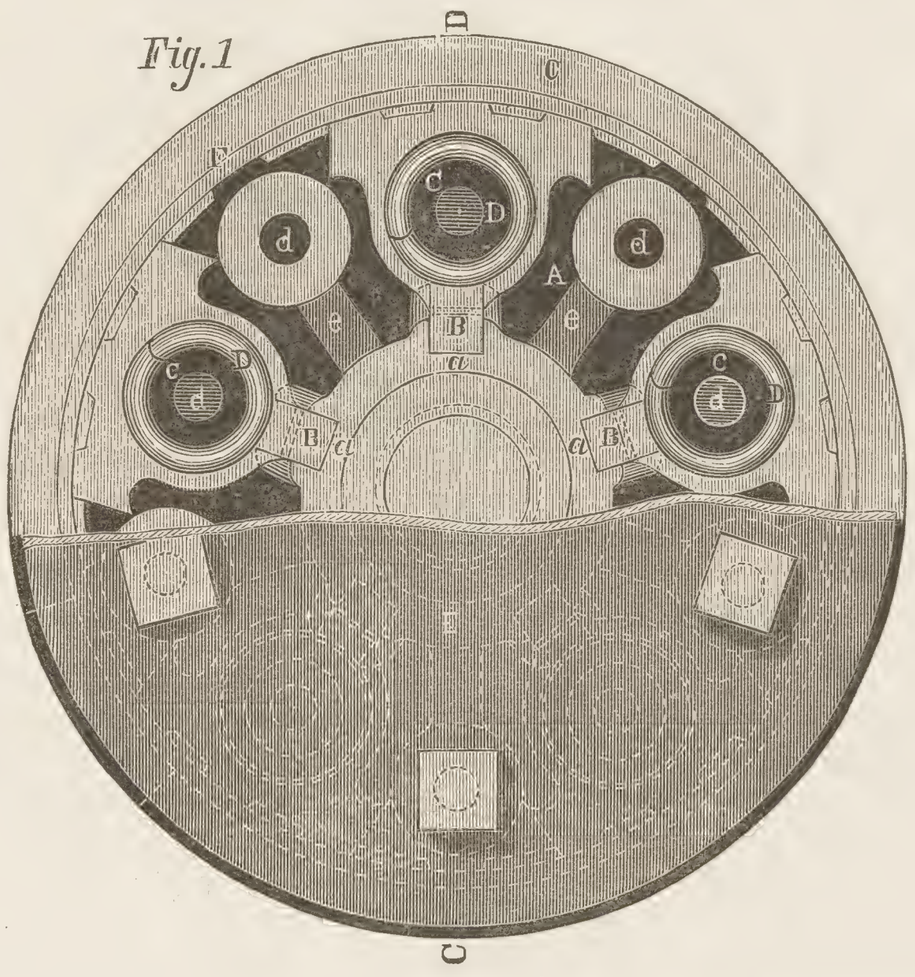
Machines reproduce certain forms with far more accuracy than the hand can do, and with much more rapidity. The result is advantageous to society at large, the workman included, but it is destructive to manual dexterity as applied in the arts. The abolition of the apprentice system has also much to do with this condition of things. When a young man served seven years at his trade he was fitted to undertake journeymen's work at the end of the time, receiving a journeyman's pay; but the system having fallen into disuse, no fixed time being required in most cases, or no penalties attaching if the time agreed upon verbally is not adhered to, young men become restless, and leave after acquiring a mere smattering of their handicraft, and go to seek their fortunes. The result is that the workshops are full of men who can do certain lines of work and no others, and manual skill in the use of all tools, with all that it involves, is no longer common. Many who are out of employment at dull seasons have only themselves to blame for it, for they have failed to become adepts, because they have learned only such portions of their business as would enable them to fill supernumerary places.—*New-York Sun.*

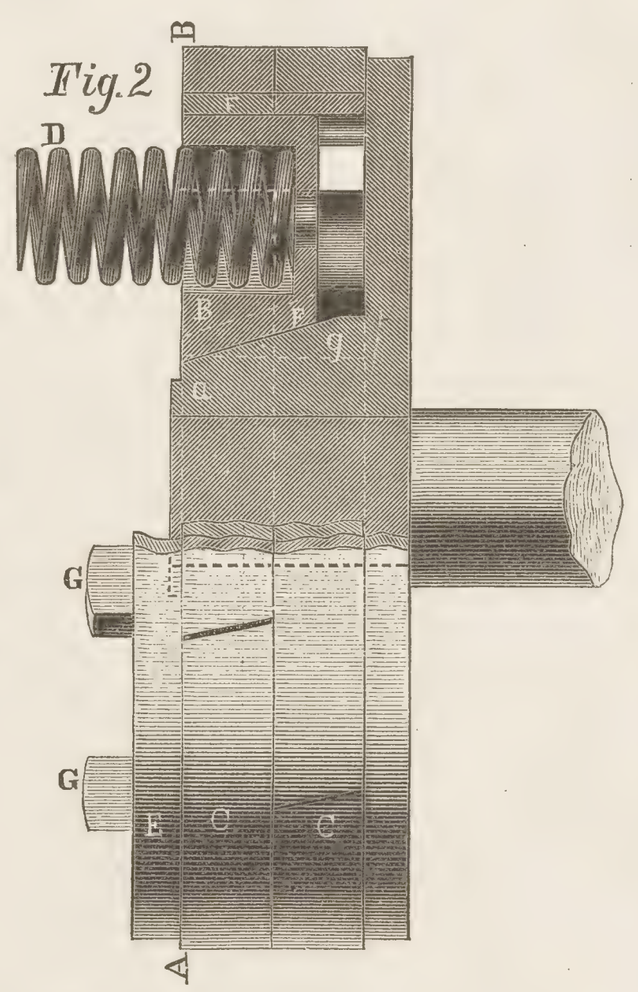
IMPORTANT changes are being made in the working of trains on the Pennsylvania Railroad proper, the office of clerk to take up the tickets and collect the fares having been added to the train force.

Boyden's Automatic Piston-Packing.

THE cuts represent an improved method of piston-packing for locomotives and stationary and marine engines. The arrangement is such that the piston-head is kept central by the equal pressure of inclined wedges, and the wear of the outside rings at all times true and uniform, thus diminishing expense in fuel, steam, and labor. Fig. 1 is a side elevation and part section of a piston-head showing the interior of the improved packing on the line A B, Fig. 2. The latter figure represents an end elevation with part section on line C D, Fig. 1. The piston-head has a series of openings at its periphery extending to the hub of the piston *a a a*. The inner or hub end of these openings are wedge-shaped as shown in Fig. 2, and receive the cup-shaped castings B, which contain the steel spiral springs D D, upon the outer ends of which the follower E rests, and which is held in place by the screws G G as usual in piston construction.

The operation is as follows: The pressure of the springs D upon the seats causes the wedges to slide and advance outward from the centre, and thus press with their outer surfaces against the inside split-ring F, which forces the outside packing rings C C automatically against the bore of the cylinder, and adapting them to any irregularity either longitudinally or in cross-area, each wedge acting independently. The utility of this improvement as respects economy and reliability has been demonstrated by its practical working. Manufactured by the American Railway Improvement Co., Harrisburg, Pa. Communications in regard to it may be addressed to William A. Boyden, Superintendent.





BOYDEN'S AUTOMATIC PISTON-PACKING.

Fast Freight Lines.

THE following argument of Col. Joseph D. Potts on the subject of fast freight lines is taken from an exchange paper:

A fast freight line performs a legitimate and valuable function to both railroad companies and shippers. It relieves the railroads from investing considerable sums in rolling stock, and saves them a heavy annual expenditure for freight agencies and solicitations at all competing points. It serves the shipper by furnishing him a guarantee that his freight will be delivered at a distant point, to reach which it must pass over several roads. If damaged, he looks to the freight line, and is not put to the trouble of seeking out the railroad company which is responsible. To a certain extent, the line is also a capitalist for the shipper. Its bills of lading are negotiable and are taken as collateral by the banks. As an illustration of the advantage this is to the shipper, Mr. Potts refers to the following case: A commission merchant in Chicago receives an order for a car of oats from a firm in Allentown, Pa. He has no money to buy the oats with, and he does not know whether his customer's business reputation is good or not. He goes on 'Change, buys the oats, gets an order on the elevator for it, hands the order to the agent of the freight line; receives a bill of lading, and with this bill goes to a bank; makes a draft on the Allentown firm for the amount, with his commission added; gets it cashed, pays for the oats, and pockets the commission. The whole transaction is ended in two hours. If the bank which takes the indorsed bill of lading had to look to half a dozen railroad companies for its security, it would have nothing to do with the transaction.

How to Burn Western Coal.

A CORRESPONDENT of the *Chicago Journal* says that this is a question which interests thousands in Illinois and Iowa. The coal-field is immense, and timber scarce, but the coal is full of gross objections to consumption for domestic purposes. It is so charged with carbon, soot, and sulphur as to banish it from the house for cooking and heating purposes. The inventive genius of the country has been turned seriously to this matter, but so far with little success. The stoves "puff" and smoke, the gas will escape, and the sulphur will destroy the iron, so that the stove is full of hideous cracks, and worthless in a short time. Experiments made with iron in the new hydro-carbon gas-works in this city the past year have demonstrated more remarkable effects of the sulphur in Iowa coal. An iron pot, two and a half inches thick, made from sheet-iron subjected to a white heat from this coal for four days, when cold, can be crumbled to pieces with the fingers. The effect was the same on the best quality of wrought-iron. Stove-makers have sought to consume this sulphurous gas, and the soot, and thus economize fuel and stoves. Nearly every second-hand store, auction, and back-shed in Iowa and Illinois is full of wrecks of the attempt to succeed. It is getting rather expensive. The best device I have seen is one made by a stove company of Cleveland. The draught, smoke, and gas rotate until they are consumed before coming in contact with those parts exposed to intense heat. I speak for the benefit and economy of thousands who are largely interested in this stove and fuel question, when I say this invention is here giving perfect satisfaction, for the parlor or office, a fact which the victim of hundreds of unsuccessful experiments will be glad to know.

ABOUT one thousand men are now employed in the Baldwin Locomotive Works, Philadelphia. Three locomotives for Brazil and one for Cuba will soon be completed and shipped. The firm have orders for sixteen first-class engines from Brazil. They are also making six for the west coast of South-America, and a number for roads in different parts of the United Staes.

The Cliff Elliptic Car-Spring.

THE remarkable carrying capacity of this improved style of elliptic, as shown in the tests published in our last issue, as well as by the work it is doing on the roads, attracts much attention among railroad mechanics and managers. As a further confirmation of its qualities, we now give the result of tests recently made in England, by Mr. David Kirkaldy, at his well-known testing works, at Southwark, London. The depressions are the mean of three tests, the springs having been previously pressed home:

TRIPLICATE SPRING FOR PASSENGER-CARS.

Length, 39 inches; depth, 10¾ inches; steel, 3 x ¼; weight, 169 lbs.

Stress in pounds.....	1,000	3,000	5,000	7,000	9,000	10,000	11,000	12,000	13,000	14,000	15,000	16,000	
Depression, inches.....	.55	1.50	2.31	3.18	3.97	4.40	4.77	5.20	5.64	6.06	6.50	6.82	set 0.12.

DUPLICATE SPRING FOR FREIGHT-CARS.

Length, 23½ inches; depth, 5¾ inches; steel, 3 x ¼; weight, 63 lbs.

Stress in pounds.....	1,000	3,000	5,000	7,000	9,000	11,000	13,000	15,000	17,000	19,000	21,000	22,000	
Depression, inches.....	.36	.73	1.04	1.35	1.64	1.88	2.15	2.44	2.69	2.94	3.78	3.29	set 0.28.

All mechanical tests made at these works admit of no question, the certificate of the proprietor being considered a standard authority both in this country and in Europe. A comparison of these tests with those published by us last month, very clearly shows the superiority of the Cliff pattern over the ordinary style. As a further illustration, we give the following memorandum of a test recently made of a "Singlet" designed for a journal-spring to be used in the limited space over oil-boxes on car-trucks. The weight of this spring is 17 lbs.; length over all, 1 ft. 4½ in.; height over bands, 5⅝ in.; steel, 2¾ x ¼. The weights and compressions under test are as follows:

1500 lbs.,	¼	in. compression.	6000 lbs.,	⅞	in. compression.
3000 "	½	" "	7500 "	1	" "
4500 "	11/16	" "	9000 "	1⅛	" "

The proportions of the ordinary elliptic of all sizes, have been determined by long experience. A 36-inch center passenger-car spring must be 13 or 14 inches high, and an 18 or 20 inch freight spring 7½ to 8¼ inches high, in order to have a proper range of action. A less height would bring the bands together before exhausting the spring's capacity. Thousands of rigid trucks are running on our roads without elliptics, because the space between the spring-boards and bolsters will not admit them. This contracted space, however, is no obstacle to the use of an 18 or 20 inch center Cliff freight couplet, which can be made not exceeding 6½ or 6 inches high, with a carrying capacity of 40 tons per set of 4 springs, weighing 240 lbs. per car, and with 3½ inches maximum motion. No other elliptic meets these conditions; and why?

It is alleged, in behalf of the old style, that it embodies the principle of the arch with a true curve, which under extreme compression comes down to a straight line, and this is said to be a correct mechanical principle as applied to a car-spring. In bridges, buildings, and other structures, the arch is used to sustain heavy weights rigidly; but suppose an arch was required to be flexible under a load instead of rigid, would not our engineers and architects be somewhat puzzled in devising rules for its construction? as much so as if they were called upon to build an elastic brick wall? Now, this flexibility is the strong point with those who adhere to the idea of an arch as an indispensable feature of the ordinary elliptic, and in order to secure this point, they unite the two long leaves at the knuckles as a foundation, and then build up the centers by adding six or more plates of steel until a sufficient thickness is obtained to carry at those points the load that one thickness of metal carries at the ends. There is nothing in this arrangement that resembles, or that is at all analagous to, the architectural arch, which is lightest at the center and heaviest at the ends, and any deviation from this principle would impair if not destroy the stability of the structure. The rods, braces, struts, and chords of a roof truss or bridge designed to sustain heavy weights, are the lightest at the center of the span and increase in strength toward the ends where the load is really borne. To reverse this principle of construction in order to carry the same load with a definite amount of flexibility or motion at the center, may result in a car-spring, if one chooses to see it in that light, but it is nothing more nor less than a common girder, and a poor one at that. There seems to be no exception to the rule that the material of any structure, either natural or mechanical, is invariably the lightest and thinnest at the point where it is required to yield or change position under strain.

If the arch is recognized as the true form to enable a car spring to carry a weight and resist shocks, there must be some particular form or modification of it that will give the best results under certain conditions. The kind of curve suited to a light load, say of 4 tons, can not be equally well adapted to sustain a load of 20 tons. And why is it necessary, in the case of 4-wheeled horse-trucks and like vehicles, to give the same spring a reflex form by turning it over and carrying the weight upon its inside—laying aside the arch curve and substituting Hogarth's line of beauty? It is no answer to say that these are street-vehicles and not railroad cars; nor will it avail to ridicule a new principle of construction merely because it is an innovation upon present usage, for the fact remains that the Cliff elliptic with one third less steel than the old style, carries the same weight and has more elasticity and resilient power. The material in the center, where the most action is needed, is taken away and applied to the ends in order to strengthen them as the span or flexibility is increased. The Cliff spring is virtually a combination of 4 half-elliptics united by the continuous hoop or head leaf. Each of these is half the length of the halves of an ordinary elliptic, and even upon the same principles of construction, they need not be half as heavy to do the same work.

In order to get a great range of action in a buffer spring, it is customary to place two or more short ones—say of ¾ inch motion each—together upon the same tail-bolt, and so long as these draw or react upon one another, they have the *strength* of but one spring, but the *motion* of all. Now, the upper and lower parts of the Cliff spring, being half elliptics, rest upon the two other halves consisting of the inside end-leaves, and impose upon the latter all the weight the spring sustains, the end sections being compressed in the same manner as the upper and lower ones; and as in the case of the long buffer spring referred to, the range of motion of the entire series is secured, so that every inch of leaf has less work to do to carry the load, and consequently there is a better reaction and capacity of resisting shocks. These premises are fully justified by the working of all lengths of the spring, from 16 to 40 inches, and by three years' practical test in severe service.

American Railway-Cars in Canada.

A RETURN was ordered during the last session of Parliament showing the number of railway-cars, both passenger and freight, imported into Canada by our various railway companies. The period which the return was to embrace extended from the 1st of January, 1873, to the end of April, 1874. It recently came to hand, and we find from it that we contrive to purchase no inconsiderable number of cars from American makers. At the port of Montreal, 17 street-cars were imported by the City Railway Co., and 1 ordinary passenger-car by the South-East Railway Co., being of total value $17,038. At St. John, the Montreal and Chambly line imported 2, valued at $3000. By far the largest number came in by way of Clifton. The entries at this port were 18 for the Great Western and 21 for the Canada Southern lines. The value was $169,924, those of the first-named road being appraised at $108,847. The Hamilton City Street Railway Co. imported 6 cars, valued at $1410, the Canada Southern 2 *via* London, worth $18,000, and the Welland line 1 at St. Catharine's, valued at $4500. At Windsor, the Great Western entered 45 box and 6 flat cars, worth $40,185, and a private firm bought in dumpers worth $2910. On summing these amounts, we find that the value of the American cars introduced into Canada during the period already stated, say fifteen months, was $259,967, the duties upon which came to the sum of $39,067.—*Toronto Times.*

Successive Contrasts in Color.

SUCCESSIVE or mixed contrast is this: the retina having impressed upon it a color which has been seen for some time, has an aptitude to be impressed with the complementary of that color, and when another color is presented to the eye at that moment, the sensation is the result of this color and the complementary combined.

It may be easily observed. Close one eye, and look steadily with the other at a color A; when the sensation is dulled, and another color, B, being immediately seen, the eye perceives a mixture of the color B with the complementary (C) of A. Chevreul gives examples of mixed contrast. The left eye, having looked at red, has an aptitude to see afterward green, its complementary. If yellow is thereupon seen, the impression is a mixture of green and yellow. The left eye being now closed, and the right opened, it sees yellow, and this may appear more orange. Now this effect of "mixed contrast," as it has been called by Chevreul, explains certain facts which are of great value to colorists. Painters, anxious to imitate the exact colors of their models, often look at them so long as to become perfectly blind to their tones and characters. This sort of color-blindness also affects any one who sees for any continued time a bright color or a picture in which a particular color predominates. Who has not in gazing at a brilliant red sunset, or bright yellow picture, been ocularly enfeebled at seeing another brilliant color? To obviate and correct these fatigued and false impressions of the retina, the dealer in colored fabrics should show, after the eye has been satisfied with red materials, green ones. So again, if the eye has been fatigued by yellow, the proper corrective, violet, should be administered, or the latter will tinge and completely destroy the evidence of any other color after yellow.

Thus this tendency of the eye to see the complementary of the color which predominates, or which has

been looked at for some time, should be carefully considered in all compositions of color, so that they should possess the complementaries, or such a balance of colors as shall correct a false impression. Now, the painter, knowing this modification of contrast, has simply to mentally estimate or allow the influence of a complementary upon an adjacent color or colors, and so regulate them in intensity and tone. It is the complex effect he has to regard, the reciprocal influence or contrast of bright colors and different tones. Taking red and blue as an example, the artist who desires the two colors to contrast most harmoniously must neutralize or destroy the effect they have when contiguous, or of the red becoming orange as it approaches the blue, and of the latter becoming green as it approaches the red; he must, in fact, emphasize the opposites of these impressions, or separate them by white or reduce them by shade. Thus we find ancients, who used bright colors, used them in strict obedience to this law; the colors were distributed in the most intelligent manner, and were separated by white, or the more retiring colors.

The law of contrast may in various ways impart value to colors, and the artist can choose what course is best in each case. The contrast of opposite colors is sufficiently agreeable when they are of the same tone. To avoid crudity, the light tones of respective scales, or to avoid monotony, pure colors mixed with gray, may be adopted.—*Building News.*

THE Grand Trunk and Eastern road has adopted the Gerrish switch and train lights; most of the other roads in New-England and some of the leading Western routes, it is said, are introducing them.

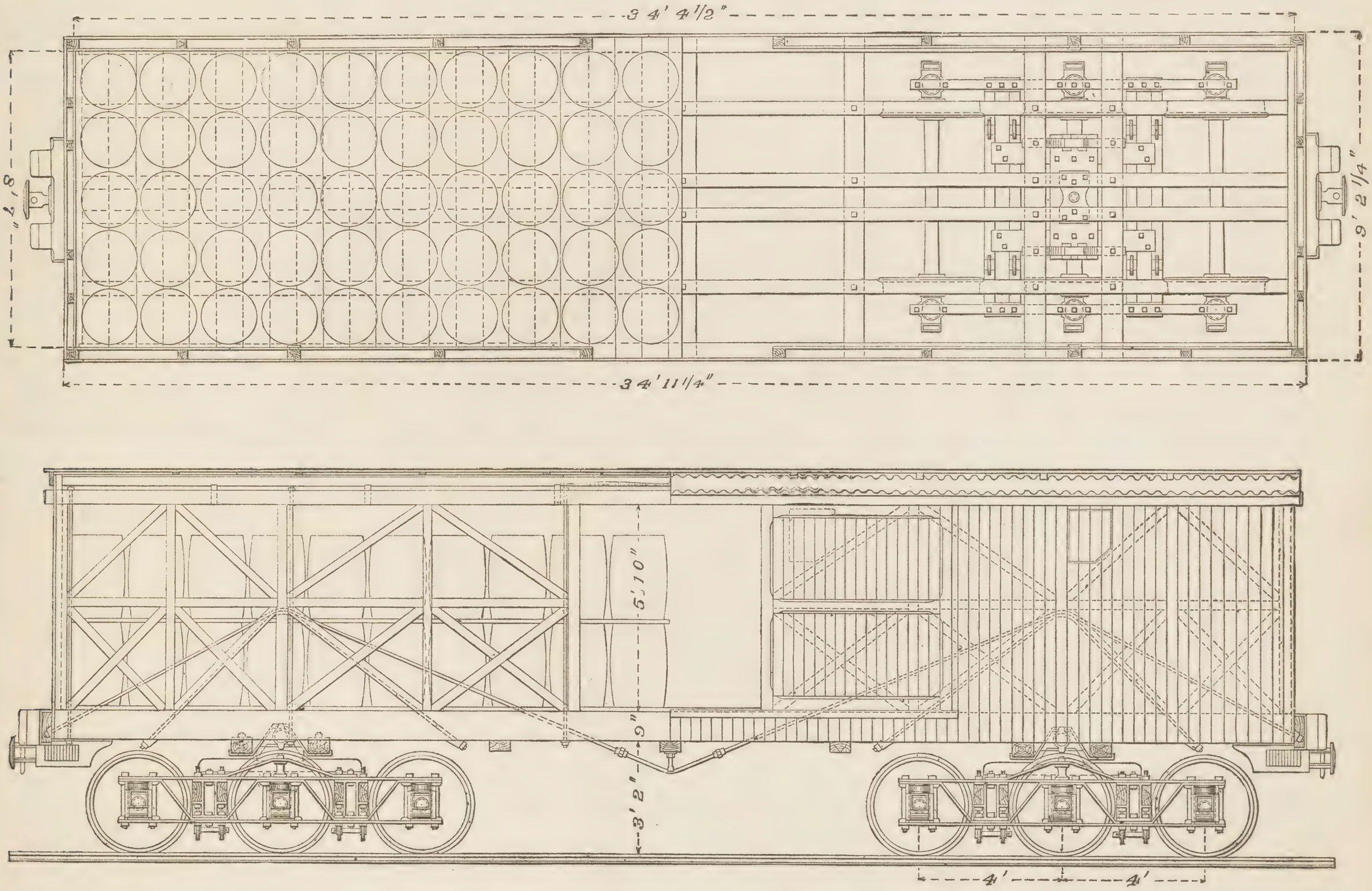
Eaton's Cheap Transportation Freight-Car.

THE drawings exhibit a plan and side elevation of a freight-car recently designed and patented by Mr. Richard Eaton, of Montreal, who for many years has had charge of the rolling-stock of the Grand Trunk Railway of Canada. We are informed that a number of these cars are now in use on this road, and that their performance fully justifies all that has been claimed for them—namely, the capacity of carrying two tons of paying freight for one ton of dead weight. Any plan of construction which secures this result, with no incidental drawbacks in the matter of cost and durability, will of course have a very important bearing on the economy of railway transportation. It is not necessary to go into any detailed estimates of the saving which would result from such proportion of dead and paying weight, if established and maintained on all the railway lines of the country. It would be immense, and equivalent to a revolution in railway operation of the greatest benefit to the corporations, as well as to the general public.

In regard to the construction of this car, we can say very little in addition to what is shown in the drawings. Its length, outside of sills, is 34 ft. 11¼ in.; width, 9 ft. 2¼ in.; height inside, 5 ft. 10 in. The trussing, bracing, roofing, and floor-framing are as shown. We are unable to give the size of sills, posts, and other parts. The trussing may, if necessary, be carried to top of plate, in which case some of the minor bracing may be dispensed with. The car runs upon iron-frame, six-wheeled, swing-beam trucks with wooden transoms.

The difference in quantity of freight carried, earnings, etc., between these and a train of ordinary 8-wheel cars, taking flour as freight, and the route from Buffalo to New-York as a basis of comparison, is represented as follows: A train of 20 ordinary cars carries 2000 bbls.; earnings, 60 cts. per bbl., or $60 per car, amount to $1200. A train of 13 Eaton improved cars carries 2600 bbls.; earnings, 60 cts per bbl., or $120 per car, amounts to $1560, or 30 per cent more than the earnings of the 20 ordinary cars. It is claimed also that the same amount of traffic, with the 12-wheel cars, can be carried on with a smaller number of locomotives and train-hands; that the trains are shorter, the sidings consequently less crowded, and a smaller space required in the shops for making repairs. The first cost of construction is, of course, something more than that of ordinary 8-wheel cars. We are informed that the inventor has also in course of construction a 6-wheel freight-car weighing 5 tons, which will carry 10 tons of freight. As such a vehicle will be something of a novelty in American railway rolling-stock, we hope at an early day to be able to give drawings and a detailed description of it.

For further information, address Mr. Richard Eaton, 267 St. Antoine street, Montreal; or Mr. C. F Manson, Car-Builders' Association Rooms, 113 Liberty street, New-York.



EATON'S CHEAP TRANSPORTATION FREIGHT-CAR.

THE Boston and Albany Railway Company have nearly completed a new depot at Worcester, Mass. The building is of stone, 250 x 450 feet, and is estimated to cost when finished, $1,100,000.

THE National Locomotive Works of Dawson and Baily, at Connellsville, Pa., are being enlarged by the construction of an erecting shop, 109 by 45 feet. The shops are running full time on a number of Mogul engines for the Cairo and St. Louis.

A Model Passenger-Coach.

A CORRESPONDENT sends us the following detailed description of a new passenger-coach which has just been completed at the shops of the Pittsburg, Cincinnati, and St. Louis Railroad, Steubenville, Ohio, under the supervision of Mr. Thomas D. Ferguson, the master car-builder.

The length of body over all, exclusive of platforms, is 49 ft. 9 in., and the width 9 ft. 7½ in. from outside of panels. There are 6 longitudinal sills framed and braced so as to make one of the strongest bottom-frames I have ever seen; and it may be mentioned for the information of those who adhere to the plan of 2 longitudinal sills with cross-framing, that the cost of the above-described plan is about six per cent cheaper, and, from actual test, about fifty per cent more durable. The transom bolsters are made of three pieces of oak, with 1 x 6 in. iron plates between, and all securely bolted together. Instead of the side-sills resting upon the bolsters, a cast-iron pocket is fitted over the ends of the latter, with a shelf for the sills which rest upon the iron. This arrangement enables the bolster* to be taken out for repairs without the trouble of spreading the sills to get out the tenons. The nuts have only to be taken off the bolster, when it at once drops down. The plan of inserting iron plates in the bolster is liable, as it seems to me, to the objection that no relief is afforded when the bolster becomes settled on the ends and the bearings are as heavy on the side friction-plates as at the centre. A wooden bolster, say 6 x 14, gained on top for the sills, and with two 1 in. truss-rods running from the centre of ends over the two centre stringers, with nuts at each end, will always relieve the side-bearings. There always should be at least ⅛ in. space between the side-bearing plates when the car is empty, as a matter of safety if nothing more.

There are two cross-tie timbers near the centre of body, trussed with one ⅝ rod, the centre being turned up. Two 1⅛ longitudinal truss-rods run the whole length of the body, holding it well together and keeping up the centre. A cast socket-washer on the outside ends of the car receives the nuts, which are hexagon, there being sufficient room for the nuts to turn in the washers, the latter being outside the panels. There is also a swivel-nut under the centre of the car. The side-bracing is on the improved plan; the braces are 1½ x 5 in. ash let into the posts flush on the outside, and running from the top of side-sill over the bolster to the corner-post just under the window-rail and toward the centre each way. They are glued and screwed to the posts, every part of the car which is not exposed to the wet being fastened in the same way. All outside exposed work is put up with white-lead. In addition to the above-described bracing and trussing, is a strap running from under and through the side-sills at the ends, upward and over wooden studs placed over the bolsters, the tops being just high enough to allow the strap to pass over them and under the window-rail. It is let into the posts flush, so as not to interfere with the panel-work. The outside panels run up and down, two under each window and one between the windows below. A continuous window-stool on the outside separates the panels between the windows above and below; the panel-joints under the windows are covered with an iron strap batten $\frac{3}{16}$ x 1; the other joints are covered with ¼ round edge poplar battens. A continuous iron strap $\frac{3}{16}$ x 1½, let in flush, runs the whole length of the bottom edge of the panels, saving them from many a bruise they would otherwise receive. The end carlines run straight across instead of being curved, which keeps the cinders from coming under the end of roof to some extent when the train is in motion. The raised roof runs the whole length of car-body; this improves the inside effect, and presents an easy curve from top to ends of carlines on the outside. The space between the ends of car and the end side-windows is enlarged so as to afford more room for saloon and heaters without encroaching on the seats.

Dripps' hard coal, hot-air heaters are used with McGee's arrangement for distributing the heat under the seats. Instead of registers on the heat-conductors between the seats, there is under each an oblong opening with an inverted tin trough which distributes the heat. There is a valve in the cold-air pipe running from the heater to the roof, which is regulated entirely by the train-men, thus avoiding the bad results of registers between the seats subject to the capricious control of the passengers. The space allotted for stoves includes only one side-window; a stationary fender an inch higher than the seat-back, is placed between the stove and seat, the seat-back not being movable. The car has seating capacity for 60 passengers. The distance from centre to centre of seats is 35 inches; width of seats, 18 inches; they have Cobb's patent springs, serpentine backs, and are upholstered with a superior quality of crimson plush. In fact, a more comfortable car-seat it would be hard to find. Howard's automatic ventilators are used, one being introduced between alternate spaces in the dome-lights. There is also a pivoted panel in each end of the raised roof (the pivots being near the lower edge of panel), by which air is admitted or exhausted through wire-cloth over the doors outside.

The interior finish is extremely elegant and tasteful. The ground work is walnut relieved with bay-wood panels veneered with walnut burl. The window and door-heads are regular oval; the former have single sashes of walnut with 18 x 28 glass. The raised roof sashes are cherry, and the blind slats of white-maple. The doors are of walnut with double sash taking 13 x 15 glass. The top sash drops. The size of doors is 6 ft. 4 in. by 2 ft. 2 in., the shortness in height being due to the shape and finish of roof inside. The form of the roof from the eaves to the raised portion is continued across the car end, which prevents the door from extending above the plate. This adds very much to the inside effect, but it makes a somewhat inconvenient door for wire-drawn people who wear stove-pipe hats. Two of Westlake's centre-lamps are used, with two side bracket-lamps, all silver-plated, which harmonize well with the gilded racks and other fittings, including finely-painted head-linings. The water-cooler is placed in the saloon, but is supplied from the roof, to obviate the usual objection to placing them in saloons. The saloons are effectively ventilated by means of pipes running from the basins to the roof, where a ventilator operates to keep up a continuous current of exhaust air.

No patent platform and coupler are used. The floor of the platform is 4 inches above the lower edge of the end-sill. It is a very good one, almost as good as any patented device, but of course there is not the steadiness when the train is in motion that is secured by the Miller arrangement. The car is mounted on the 4-wheeled standard trucks of the road, which in my judgment are not as well suited to such a car as 6-wheel trucks, but it is doubtless a matter of economy for the time being. McGee's patent bearing and key-plate, illustrated and described in August number of CAR-BUILDER, are used on this car, and have been ordered on all new work for the road, a year's test having proved its superiority. The axles conform in length to the M. C. B. standard, but the journals are 3¼ x 7. The weight of the coach is 33,600 lbs.; the outside color, a mixture of umber and light brown, which has been the standard color of the road's passenger stock for the past 8 years.

We noticed at the shops two sleeping-coaches that are being changed into day cars, and which when completed will be very elegant, large, and roomy. The above-described new coach went into service on the 1st of January, and forms a part of conductor Mooney's train, who is one of the oldest conductors on this road, if not in Ohio. I am indebted to the courtesy and kindness of Mr. Ferguson, the M. C. B., for much of the information herein contained.

* We substitute the term "bolster" for transom in accordance with the forthcoming Dictionary of Terms.

About Journal-Bearings.

To the Editor of the National Car-Builder:

DEAR SIR: Of the many details belonging to a car-truck, there are probably none that exhibit a greater variety of patterns than journal-bearings and key-plates. The old flat-top brass, with a shoulder in the top of box, instead of key-plate, to keep it in place, is now seldom met with. A few only survive as relics of the past. The various kinds of "saddle-brasses" are also becoming nearly obsolete. These usually have a recess across the top 2 or 2½ inches wide and ¼ inch deep, into which a corresponding projection in the top of box fits and keeps the brass in place. Some have a lug or projection on the outer end to take hold of when putting them in or taking them out. The main objection to this style is its center-bearing, which in time wears away the journal, and makes its surface hollow or concave; and when a new brass is put in the ends take the bearing, causing friction and hot boxes. We know of one instance in which a brass of this kind is used, its length being 5¼ inches, or rather 4¾, after allowing for the chamfered ends; and the journals 3 × 5¼. The brass is filled with Babbitt metal, thereby reducing its strength about one third. Here the immense disproportion between weight and bearing surface is manifest. Imagine a 20-ton coach, with its complement of passengers, and running upon 4-wheel trucks, with such bearings as these! Is it any wonder that the boxes smoke and blaze?

Next we have the key-plate, which, as regards the concave wearing of journals, is superior to the center-bearing or saddle-brass. We are speaking of the square-top brass and flat key-plate with shoulder near the outside end. In order to make this plan a success, the brass and plate should be of an equal thickness at the ends, and the boxes true and square in the truck-frame—points that are not always looked after in contract shops. In freight-car trucks, for instance, if the arch bars are not true, one end of the box will incline upward and cause the weight to bear upon one end of the journal. The weight of a loaded car will of course bring the bearing to a level, but there is nevertheless a continual strain in the truck-frame. This is one of the principal causes of hot boxes where this style of bearing and key-plate is used.

In the CAR-BUILDER for March, 1874, was illustrated and described an oil-box and center oscillating brass, so arranged that the latter would always find its level without regard to the position of the box, there being a round lug in the top of box which fitted into an oblong recess in the brass, which sloped away toward the ends. This was a success in all respects except, that being center-bearing, it wore the journal too much in the center when the brass became thin. Some years since, the Atlantic and Great Western road adopted a journal turned straight without a collar, the brass bearing having a projection extending down and over the end of the journal one half its diameter, the back of the bearing fitting into a recess in the top of the box. This plan, for some reason, proved to be short-lived. The standard oil-box, brass, and key-plate adopted by the M. C. B. Association, are very good in some respects, but do not give entire satisfaction, especially upon Western roads, where it is considered by many to be unnecessarily heavy.

Another plan which has proved very satisfactory, so far as it has been tested, was devised several months ago by Mr. James McGee, at present M. C. B. of the Houston and Texas Central Railroad. This plan was illustrated and described in the August number of your paper. The top of brass is octagon, with a ½ inch shoulder at the back end. The key-plate is cast-iron, and fits the brass, holding it to a uniform bearing until entirely worn out. As a test, a set of these bearings were put upon a truck of coach 18 of the Pittsburg, Cincinnati and St. Louis Railroad, on the 22d of April last, while the other truck had bearings of the old pattern. On the 15th of October they were examined, and McGee's bearing had been reduced from 6 lbs., original weight, to 5 lbs. and the others from 6½ lbs. to 3½. The mileage of the coach was 34,531.

The same quality of metal was used in both patterns. The old style had to be replaced, while the new ones were capable of wearing out another set of the old. The merits of the McGee bearing are a great saving of metal and uniformity of wear. The two roads above named have adopted it, as we are credibly informed, after giving it a fair trial, and several other roads are testing its qualities. The writer hopes this subject will receive the attention it deserves by the committee of the Association having it in charge, and that an interesting report will be forthcoming at the next annual meeting. CAR-BUILDER.

The Common Hammer.

FEW people, says Mr. J. Richards, in witnessing the use of a hammer, or in using one themselves, ever think of it as an engine giving out tons of force, concentrating and applying power by functions which, if performed by other mechanism, would involve trains of gearing, levers, or screws; and that such mechanism, if employed instead of hammers, must lack that important function of applying force in any direction that the will may direct.

A simple hand hammer is, in the abstract, one of the most intricate of mechanical agents, that is, its action is more difficult to analyze than that of many complex machines involving trains of mechanism; but our familiarity with hammers makes us overlook this fact, and the hammer has even been denied a place among those mechanical contrivances to which there has been applied the mistaken name of mechanical powers.

Let the reader compare a hammer with a wheel and axle, inclined plane, screw, or lever, as an agent for concentrating and applying power, noting the principles of its action first, and then considering its universal use, and he will conclude that if there is a mechanical device that comprehends distinct principles, that device is the common hammer; it seems, indeed, to be one of those things provided to meet a human necessity, and without which mechanical industry could not be carried on. In the manipulation of nearly every kind of material, the hammer is continually necessary in order to exert a force beyond what the hands may do, unaided by mechanism to multiply their force. A carpenter in driving a spike requires a force of from one to two tons, a blacksmith requires a force of from five pounds to five tons to meet the requirements of his work, a stone-mason applies a force of from one hundred to one thousand pounds in driving the edge of his tools; chipping, calking, in fact nearly all mechanical operations consist more or less in blows, and blows are but the application of an accumulated force expended throughout a limited distance.

Considered as a mechanical agent, the hammer concentrates the power of the arms and applies it in a manner that meets the requirements of the work. If great force is needed, a long swing and slow blows accomplish tons; if but little force is required, a short swing and rapid blows will serve, the degree of force being not only continually at control, but the direction at which it is applied also. Other mechanism, if used instead of hammers to perform the same duty, would from its nature require to be a complicated machine, and act but in one direction or in one plane.

THE Fitchburg Railway Company is about to build a new freight depot in Boston for handling way freight. It is to be six hundred feet in length.

Improved Application of Truss-Rods.

A VERY large proportion of the expense of keeping railway-cars in good running condition, is caused by the pulling out or loosening of the draw-head timbers, and consequent breaking of bolts, often involving the destruction of the entire car-end, the detention of trains, and danger to property and life. The invention we herewith illustrate is designed to obviate this difficulty, and that it does so very effectually, is evident from a glance at the engravings, in which the construction is so plainly shown as to require little explanation.

Fig. 1 is a bottom view of the floor framing, showing the position of the truss-rods and draw-head timbers. Fig. 2 is a side-view of the same, partly in section. The improvement consists in the employment of two or more rods in such a way as to support not only the center of the car, but also the draw-head timbers both vertically and longitudinally, the rods passing over the bolsters and under the central truss-beams, while the ends of the two central rods are firmly bolted to transverse bars or plates in front of the draw-head timbers, as shown. It will readily be seen that this connection of the rods with the draw-head timbers, subjects them to a direct *pulling* strain, which would otherwise be sustained exclusively by the bolts or fastenings of the timbers—in other words, the usual strain upon the draw-head timbers is mainly transferred to the rods, while these at the same time distribute the vertical support of the bolsters, give rigidity and strength to the entire structure, and prevent the loosening of joints from shrinkage and jar.

Fig. 1.

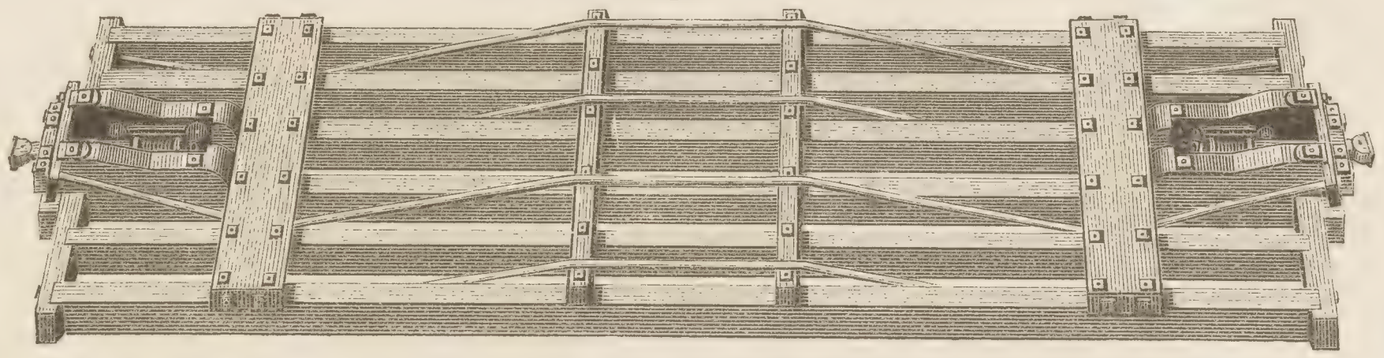


Fig. 2.



The rods are represented in the engravings as continuous; but in order to facilitate their application to different cars, and to assist in tightening and straining them, they may be made in two sections with adjusting links in the center. When made continuous, they may be tightened by screwing up the nuts at the ends.

This method of applying truss-rods is the invention of Mr. R. M. C. Parker, of Memphis, Tenn., who furnishes several very flattering testimonials from railroad officers, setting forth its economical and satisfactory working. In applying it, nothing now in use need be thrown away. The inventor and patentee may be addressed as above.

Economical Consumption of Fuel.

G. F. BECKER, in an address before the Royal School of Mines, Berlin, says:

"The progress in the economical consumption of fuel in the last fifty years has been enormous, and has been effected in great part by metallurgists; and here again we find the scientific men taking the lead. In the economical application of the heat developed by fuel, the Bessemer process is enormously effective, not more than ten pounds of coal being requisite for the production of a hundred-weight of steel from pig-iron by this method, while in the older process, still in use for fine qualities of steel, two hundred and fifty pounds are needed. Siemens, by making the heat which would escape through the chimney of an ordinary furnace warm the fuel and the air necessary to combustion, obtains an economy of two thirds the weight of fuel. It was Faber du Faur, an accomplished Bavarian metallurgist, who first made practical use of the gases which formerly escaped in immense quantities from the tops of blast-furnaces and the enormous blast-engines, the hoisting-engines, pumps, and hot-blast stoves, often even the roasting-kilns of such establishments nowadays require no fuel except this long-neglected waste product. Bischof, another German engineer and metallurgical author, was the first to produce gas artificially for smelting purposes, and this was certainly one of the greatest advances ever made in our art. By first turning it into gas, fuel can be much more perfectly consumed than in the solid form, and hence can be made to give us, as in the Siemens furnace, in which only gas is used, a much higher temperature than is practically attained by the combustion of coal in the ordinary way; but perhaps the greatest advantage of gas is that substances in general scarcely regarded as fuel at all can be employed for the production of gas with the most brilliant results, a matter of the greatest importance, especially in a region destitute of true coal like California. Lundin, a noted and thoroughly educated Swedish metallurgist, has taught us how to produce gas from wet sawdust entirely without preparation, of such power that wrought-iron may be melted with it, and the great difficulty is to find any material infusible enough to answer as a lining in the furnaces where it is consumed. You will receive some idea of the importance of these improvements from the fact that the economy in fuel effected in England alone in the year 1872, as compared with 1871, by the progress made in the introduction of more perfect apparatus, represented more than four millions of tons of coal.

Automatic Distance Indicator.

THE *Cleveland Herald* says that an invention which has been placed upon some of the cars of the Lake Shore and Michigan Southern Railroad for trial, is designed for the purpose of signaling, in order that the distance of a train may be known as soon as it is seen, and the liability of accident rendered far less. The arrangement is very simple, and consists of a reversible platform which is located upon the top of the caboose, upon either end of which are placed two sheet-iron lanterns joined together by a tube about six inches in diameter. In one of these lanterns is placed a lamp, and in the other is a mirror, placed so as to reflect the light through the tube. The lantern containing the lamp can be made to show a white, green, or red light, as may be required, by placing in front of the light the different colored glass. A mile distant, only one light can be seen. At any distance nearer, there are two lights shown at different distances apart, according to the distance of the signal. The conductor is provided with a table showing the comparative distances, and by this he can tell very accurately how far he may be from a train or other point of danger. Should this signal-lamp work well n practice, it is likely that it will be extensively adopted by the railroad company.

THE Pennsylvania Railroad Company has begun a new iron structure to take the place of the old wooden bridge across the Delaware at Trenton, which has stood for seventy years, and was in its day considered the finest specimen of bridge architecture in the county.

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Editorial Announcements.

CORRESPONDENCE.—*We cordially invite the co-operation of the railroad public in affording us the material for a good mechanical paper. Articles relating to rolling-stock and machinery, by those practically acquainted with those subjects, will be gratefully received. All communications must be addressed to Vose, Dinsmore & Co., No. 32 Warren Street.*

ADVERTISING RATES.—*For one square, or one fifth of a column, $5 per month, or $50 a year. For half a square, $3 per month, or $25 a year. Larger advertisements by special contract.*

All communications in regard to advertising should be addressed to L. F. DINSMORE, *Post-Office Box* 4055, *New-York City, who is our agent for advertising, and authorized to make contracts, collections, etc.*

Notice to Subscribers.

THOSE of our subscribers who are in arrears for the past year, or who desire to continue their subscription for 1875, will do us a favor by making early remittances. The price is only $1.10 per annum, postage prepaid.

As an inducement for the formation of clubs among those connected with car and railway shops, we will send the CAR-BUILDER for one year, gratis, to parties who will forward us the names of 10 subscribers to one address.

The Ninth Annual Convention.

IT may not be altogether premature to call the attention of members of the Master Car-Builders' Association to the fact that the time for holding their next annual meeting is only four months from now, and that whatever preparation is necessary to render such meeting productive of good results must be made during this comparatively short interval. We do not know what progress has already been made by the several committees appointed last year to investigate and report upon the subjects assigned to them. For aught we know, they may have been industriously engaged for weeks and months past in collecting such information and materials as will make their forthcoming reports instructive and valuable. We fear, however, that the greater portion if not all of this preliminary labor is yet to be performed. It may be that owing to the brevity and tardiness of the responses heretofore made to the circulars sent out by committees, this method of obtaining information is to be in some measure abandoned, although we do not see what better plan can be devised to take its place. At this present writing, we have heard of but two circulars that are in readiness for printing, and none at all that have been printed and sent out. This, it must be admitted, is not a promising indication.

It must be manifest to every master car-builder, that, in order to mature reports for the next meeting that will reflect credit upon the Association and promote the interests of railroads, much time and labor must be devoted to them. If their preparation is deferred until a week or two before the meeting, they will necessarily be crude, ill-considered, and unsatisfactory, instead of embodying as they should do the results of a year's careful inquiry and investigation. We are aware that no committee can construct a good report unless the material is at hand to make it with; and as a good deal of this material has heretofore been furnished in the form of "Yes" and "No," or in phrases of almost equal brevity, we would suggest that all interrogatories hereafter sent be framed in such a way as to draw forth replies of greater amplitude. It is not a very difficult or laborious task for three or four men, whether they agree in sentiment or not, to put their views upon any given subject into a report; but such views may be narrow and partial and reflect merely local and individual experience. It is well known that there are a great many problems in car construction that require elucidation in order that such improvements may be made as will secure greater economy and efficiency in operation as well as uniformity in practice. These problems are many of them exceedingly difficult and complicated, requiring for their solution practical knowledge, wide observation, careful analysis, and unbiased judgment; and when all attainable facts and data have been gathered, it is important that the conclusions should be presented so clearly that the labor involved will not have been in vain. Every report made by a committee should contain some valuable addition to previous knowledge, and constitute a distinctive point in railway progress.

As an illustration, we may refer to the size and framing of freight and passenger cars. The committee having this subject in charge is instructed to recommend "suitable sizes," which implies that the present sizes are either not suitable, or if they are, that the fact needs to be ascertained and placed beyond question. To determine what *are* suitable sizes, involves the economical adaptation of cars, and of freight cars particularly, to the requirements of a diversified traffic, embracing agricultural and mineral products, miscellaneous merchandise, manufactured articles of light and heavy bulk, perishable property, etc. Intimately connected with this inquiry, and indeed forming a part of it, is the relative or minimum proportion of dead weight to carrying capacity, a most perplexing question, which can not be determined, even with respect to the ordinary standard box-car, without prolonged experiment and observation. We refer to this particular branch of inquiry as an illustration of the labors imposed upon committees, and to show how inadequate to their performance are a few short weeks just before the yearly meeting

The discussions which take place every month at the rooms of the Association in this city, contain much that will be of service to committees; indeed, they are likely to become an important auxiliary to the method of procuring information by means of circulars. The views already published of the car-wheel manufacturers, embrace many valuable ideas which could not be obtained from any other source. Our present issue contains a summary of what was said on the subject of car-framing at the January meeting. This subject will be resumed next month, when a more extended discussion of it may be expected.

Broad-Tread Wheels and Mixed Gauges.

THE unsatisfactory results of railway operation during the past year, owing to diminished traffic and low rates, together with the prevailing clamor for cheap transportation, are directing attention more than ever before to the remediable defects of the system—defects which have been almost entirely overlooked or unheeded during the flush times that prevailed from the close of the war until the so-called panic of 1873. One of these defects is the lack of a general uniformity of gauge, and which is productive in many ways of serious drawbacks upon railway prosperity. It necessitates the use of broad-tread or compromise wheels to an extent which is hardly realized by any one who does not make it a special subject of inquiry. It may be urged that the use of such wheels is, under the circumstances, a matter of economy; but it is a kind of economy which makes more serious inroads upon net earnings than is generally supposed, and the necessity for it should be removed as speedily as possible by dispensing with mixed gauges.

According to Poor's Manual for 1874–5, there are in operation in the United States 67,530 miles of railroad. Of these, 2266 miles have a 6-foot gauge; 11,780 miles have a 5-foot gauge; 44,655 miles are 4 ft. 8½ in. gauge; and 8829 miles have mixed gauges of 4 ft. 9 and 4 ft. 10 in. The total number of cars upon all these roads, according to estimates that are believed to be approximately correct, may be put down in round numbers at 360,000, and under which there are not less than 2,700,000 wheels, or an average of 7½ wheels to a car, making due allowance for 6-wheel trucks and 4-wheel coal-cars. Now if we set aside the 14,046 miles of wide-gauge roads, as above, which do not admit of any interchange of cars, and which constitute in this respect a separate system, we shall have remaining 53,484 miles of road, five sixths of which (44,655) are 4.8½, and one sixth, (8829) are 4.9 and 4.10 gauges. The car equipment of these 53,484 miles may be estimated at not less than 324,450 cars, or a fraction over 6 cars per mile. It is safe to assume that fifty per cent of these cars have broad-tread wheels, making an aggregate of 1,217,000 wheels weighing from 30 to 60 pounds each more than those of the ordinary tread, and costing about $1 per wheel more than was necessary except for the purpose of running over the 8826 miles of mixed gauges, and to which the 44,655 miles of standard gauge are to this extent made tributary. This is taxing the many for the benefit of the few, or in other words, it is making wheels by the million with a superfluous weight and bad fit for five sixths of the mileage, and not even fitting the other sixth any too well. To this mixed gauge system are also due the variations in the length of axles and the difficulty of establishing a uniform standard, to say nothing of the proportions of journals and wheel-fits. Millions also have been absorbed in loss of car service and in providing a surplus stock of axles, brasses, etc., for repairing foreign cars.

The cost is the objective point. It is this which tells upon earnings. If we take the fifty per cent of wheels as above, costing $1 each more than those of narrow or ordinary tread, and also the vast number that have been worn out and replaced, we can see quite readily where millions of railway resources have gone, and a corresponding tax necessarily imposed upon the public in the shape of higher rates for transportation to make good the deficiency. This class of wheels have also a shorter life and make less mileage, owing to the uneven wear upon the tread, as every master car-builder's "bone-yard" attests, and where wheels may be seen with the chill-marks still visible on the outer edge of the tread while the inner portions are badly grooved. Estimating the cost of a broad-tread wheel, fitted to the axle and ready for running, at $20, and its maximum mileage at 40,000 miles—which is a liberal allowance—each mile represents a cost of ½ a mill for wear alone. Now if a narrow-tread wheel upon a suitable gauge will make, as it should do, 5000 additional mileage, there would be a comparative saving of $2.50 per wheel; or even if the mileage were no greater, there would still be the difference in its favor of $1 in first cost, besides a less wear upon the rails from its lighter hammer-blows upon the joints.

A comparison of the car-mileage and earnings of some of our leading trunk lines, shows that while the former is increasing the latter is diminishing; and if this process keeps on, a crisis of very grave perplexity will in due time be reached. The rates of fare and freight must either be raised or operating expenses curtailed. The first would conflict with the unmistakable spirit and tendency of the times, leaving no alternative but the introduction of such reforms and improvements in operation and construction as will preserve the ratio between the two factors.

A more judicious selection of car material, the cutting down of sills, posts, and castings, changes in dimensions, etc., are all steps in the right direction; but it seems to us that some energetic movement on the part of railway magnates and managers throughout the country, looking to a more complete uniformity of gauge, is a matter of paramount necessity. The experience of the past few years shows that the gauges of long lines can be changed with but slight interruption to regular traffic. All that is required to bring it about is determination, organization, and a sufficient reserve of available cash.

The cheapest and most expeditious method would seem to be to reduce the wider gauges to the already recognized standard of 4.8½. With respect to locomotives, but few have been built within the past ten years for a 4.10 gauge that could not be altered to 4.8½ without new axles, and with only new wrist-pins. If the fire-boxes are too wide to admit of contracting the frames to make room for the springs with the present bar-frames, the difficulty may be overcome by using the slab-frame at the fire-box line, adopted by Mr. Eddy of the Boston and Albany Railroad, which, if objectionable in style and appearance, is not so in any other respect. The slab-frame and suspended spring will avoid considerable expense in changing the fire-boxes.

Stone's Double Automatic Coupler.

THE description of this invention furnished us for publication in our last issue, contained an important error in regard to the cost of applying the same to passenger-coaches. Instead of such cost being $100 as stated, it does not exceed $75 for any kind of car, new or old. It should also have been mentioned that the coupler is particularly adapted to freight-cars, which may be equipped with it at about the same cost as that of the ordinary wrought-iron draw-head and fixtures. In heavy freight service, it will be found particularly serviceable, and its practical working thus far has fullfilled every requirement of safety, economy, and effectiveness. It is at the same time equally well adapted to passenger-cars.

THE Swiss government has proposed an international congress of all railway administrations in Europe, to deliberate upon the following points, namely: (1) The limits of the responsibility of the company which originally receives goods for a distinct destination, and that of the companies which transport the goods afterward. (2) What is to be considered a competent tribunal in case of disputes between the diverse interests? (3) The establishment of a uniform procedure to ascertain the damages caused to goods during the time they are in the keeping of the railway compa nies. (4) The acceptance, as a general rule, that the company which finally delivers the goods shall be responsible to the receiver, receiving, of course, its rights as against the companies which preceded it in the carrying.

IT would seem as if the days of iron rails were numbered. Railroads that can afford it—and the difference in price between fair iron rails and Bessemer is now but little—will hereafter relay their track with steel, which has proven so much more economical. Roads with light traffic, and those that financial condition compels so to do, will use iron still, but even on these it will probably be found full as cheap in first cost to use a light steel rail, and much the cheapest in the end. And yet a *good* iron rail has more wear in it than is generally supposed.

MR. J. B. BAUGH is about to start the largest steam forge in the West. It is to be on the Detroit River, about two miles below the city of Detroit. The heating furnaces are nearly completed, and the establishment will soon be ready to start. He will have seven steam hammers, five of which are furnished by Ferris & Miles, of Philadelphia. In connection with the forge there is a machine-shop with heavy tools for finishing all kinds of marine and other heavy forgings.

Car-Builders' Monthly Meeting.

THE regular monthly meeting was held at the rooms of the Association, 113 Liberty street, on Thursday evening, January 21st. The number in attendance was not quite equal to that of the two previous meetings, which was doubtless due to the very inclement weather.

The President, Mr. Leander Garey, called the meeting to order, and announced that Prof. De Volson Wood, of the Stevens Institute of Technology, Hoboken, N. J., was present in accordance with the invitation extended to him at the last meeting, and would present his views in regard to the strains to which the frames of car-bodies are subjected.

Prof. Wood was then introduced, and addressed the meeting in regard to the theory of strains as applied to the arrangement of timbers in the construction of bridges and cars, pointing out the difference in the two classes of structure and the various conditions peculiar to each. His remarks were illustrated by a wooden model of a bridge-span with bracings and supports, and also by numerous diagrams on the blackboard. It would be impossible to convey by mere description a clear idea of the points presented without the aid of drawings. The strains to which the frame of a car is subjected are more complex than those of a bridge; the end supports were different, and in order to determine the character of the strains, the nature of the load must be taken into account. A structure to be perfect must fulfill all required conditions. Defects were caused by overlooking some one or more of the elements involved in the problem. Instances were referred to and illustrated, in which, from a lack of thorough practical and theoretical knowledge, timbers in the form of braces, supports, etc., were introduced in such a way as to contribute nothing to the strength of a structure, but rather to overburden and weaken it.

After Prof. Wood had concluded his remarks, which were listened to with the closest attention, a good deal of desultory conversation followed, and many inquiries were addressed to him upon the various points he had presented.

Mr. E. A. Olmstead spoke of the desirability of increasing the carrying capacity of freight-cars; they were now sufficiently large, and by strengthening a ew weak points, might be made to carry 15 tons of freight. There were, however, a great variety of patterns on our roads, causing great trouble in the handling of "foreign" cars, hardly any two pieces in them being alike. We wanted more uniformity in construction, something like an "International" pattern, which would work a great saving of material, time, and labor, and insure better cars. He thought a car might be made of the same width as those now in use, and perhaps 30 feet long, that would carry 15 tons.

Mr. C. A. Smith favored longer cars. He believed in using 4-wheel trucks, but thought 15 tons was too much of a load for them. If the roads would put under freight-cars 4-wheel trucks with a spring motion, the same as under passenger-cars, more load could be carried, and with no more injury to the track. With 6-wheel trucks the load might be increased to 20 tons.

Mr. M. C. Andrews thought the best way to make a freight-car was to sheath it lengthwise instead of up and down, making the corner and door-posts enough larger to receive the ends of the sheathing. A bolt should also be run from one post to the other. This plan had been tried by some roads, and the cars stood up better, and a protection was also afforded against the beating in of rain. A broken sill could also be repaired or replaced without removing the whole of the sheathing. He would recommend 30 feet for the inside length of car.

Mr. M. P. Wood was decidedly in favor of increasing the capacity of freight-cars. In the matter of earnings, the roads were every year getting less and less for a given amount of tonnage. An engine could make a cheaper haul with 15 tons in a car than with only 10 tons, besides requiring less side-track room. How we shall get this increased capacity in cars 30 or 34 feet long with the present width of 8 ft. 6 in., or even if it is increased to 9 or 9½ feet, was a debatable question. In hauling light and bulky freights that are now carried at first-class rates for the reason that bulk has the advantage of weight, we need larger cars. Shippers are not going to pay these rates always. He thought a car 32 or 34 feet long and 9 feet wide, would meet the requirement, do better service, and give better satisfaction at the end of 5 or 10 years than a 26 or 28 foot car 8 ft. 6 in. wide. There was no reason why 15 or 16 tons could not be carried safely on 4-wheel trucks. The load on each wheel was less than that on wheels of passenger-car trucks or those of locomotive-tenders.

Mr. Andrews thought it would be a mistake to increase the width of cars, as it would cause trouble in running into freight-houses and upon platforms where no provision had been made for such increased width.

Mr. Wood said that Western roads had already begun to make their cars 8 ft. 8 in. wide, and as most platforms were adapted to the ordinary passenger-cars, no inconvenience could arise from a width of 9 feet. It was simply a question whether it would be better to build 34 ft. cars 8 ft. 6 in. wide, or 30 ft. cars 9 or 9½ feet wide. A great deal of room is now wasted in loading barrels of flour, boot and shoe boxes, etc., which would be saved if the cars were built so as to accommodate just so many tiers. Every inch of room should be utilized.

Mr. Smith had no objection to enlarging a freight-car, but was opposed to putting so heavy a load on 8 wheels. When the standard axle was under discussion, he had claimed that it would carry a greater load, and was met by the reply that they did not want to put a greater load on 8 wheels. It is not that the wheels and axles are too weak, but the damage inflicted on the truck is what should be avoided.

Mr. W. E. Chamberlain said it was unnecessary to have axles larger than 3½ x 5½ to carry from 12 to 15 tons. The grain-cars from the West would average this capacity. If the small axles we have been using would do this, he could not see why the capacity of a freight-car could not be doubled with the M. C. B. standard axle, or with 4 x 8. As regards the length and width of cars, he did not think there need be any trouble on that score.

Mr. Wood said that if an ordinary 10-ton car was increased to double its capacity, the increase in weight would not be equal to two such cars.

Mr. D. A. Hopkins said that the power wasted by the shaking of cars at a high speed was an element in the problem which should be considered. It was suggested in reply that this was due to bad boxes, frogs, defects in track, etc.

Mr. Smith had understood that cars were now being built 35 feet long, with 6-wheel trucks, and designed to carry 20 tons of load; 200 barrels of flour could easily be packed in them. He asked if there were any objections to such proportions or to such capacity?

Mr. L. Garey said there were many 34-foot freight-cars in service, and had been for several years. He could see no difficulty in carrying 15 or even 18 tons of freight on 8 wheels. It was being done every day. Nor could he see why railroad officers should object to freight-cars of this capacity running over their roads, while locomotives and sleeping and drawing-room cars weighing 30 tons were doing the same. The dead weight of these last-named cars was much greater than that of freight-cars. He thought it was perfectly safe, and would not injure the track to carry 15 tons on a truck.

Mr. Chamberlain suggested that the number of wooden bridges would cause difficulty. It would not do to concentrate too much weight on them, and this might be one objection to doubling the capacity of freight-cars.

Mr. W. E. Partridge alluded to the shaking of trains. Power was required to roll a train from side to side; this power must have a fulcrum and this was

the rails, ties, and ballast. If the cars were mounted on a little better trucks, there would be less rocking. He had seen a few freight-cars on passenger-trucks, and the only difference between them and the passenger equipment was the fact that they were *black* trucks. Peaches could be transported to market in these cars at passenger speed, and in good condition, which proved that the train did not shake as much as ordinary freight-cars. The trucks had springs that had some action, and when the box went up and down, the cars did not roll so as to take a man off his feet.

Mr. Chamberlain suggested that the general superintendents of roads be conferred with for the purpose of ascertaining whether an increase of capacity in freight-cars would meet their approval.

The discussion was here closed, and the further consideration of the subject was deferred until the March meeting. It was also decided that car-builders be requested to furnish at such meeting, models of different kinds of side-framing of freight-cars, according to dimensions as follows:

First. 28 feet long; 6 feet high between sills and plates; 4 feet 6 inches between centre of transom and outside of car.

Second. 35 feet long; height, 6 feet between sills and plates; 5 feet between centre of transom and end of car.

Third. 40 feet long; height, 6 feet between sills and plates; 6 feet between centre of transom and end of car.

The models to be constructed of hard pine, to a scale of 1½ inches to the foot; the doors to be represented as 5 feet wide in such models.

After a vote of thanks to Professor Wood for his interesting and instructive address, the meeting adjourned.

New-York Elevated Railroad.

It is said that the managers of this road, in the absence of other rapid transit, have at last resolved to extend their road at once to the Harlem River, and contracts for the iron work, for the steel rails, and for the building of the road have been given out, and just as soon as the weather will permit, the work intended will be commenced. The iron-work is already under way, and the rails, which are to be of the best Bessemer steel, will, no doubt, be ready by the time they are required for laying down. In regard to the double track, the engineers have decided to commence it at Bank street, and run it for a distance of 1200 feet up Greenwich street. This will give a road-bed upon which four or five engines, with their trains attached, can be run without trouble or danger, as the switches will be placed at such convenient distances as to afford accommodation for all coming or going trains as quickly as desired. Should it be found necessary, as the travel over the road increases, to lengthen the line of the double track, it will be extended as far up as Twelfth street, with the same precaution in regard to switches. By this new arrangement, the distances that now require about thirty minutes for the run will be made, according to the engineers' estimate, in seven and a half minutes. In regard to the lower extension, no steps have yet been taken to have the road pushed; but it is the intention of those interested to yet secure such influence as will in the end carry the measure through.

Mr. John S. Sargent retired on the first of January from service on the Michigan Central Road, to engage in private business in Chicago. He has been connected with the Michigan Central offices during fourteen years, being engaged in the freight department until 1864; since that date he has been the cashier of the road, performing, also, responsible service in connection with the superintendent's office. His experience in accounts, coupled with great energy, methodical business habits, integrity, and courtesy, gives assurance of a most successful business career.

Steel and Iron Car-Wheels.

To the Editor of The National Car-Builder:

Dear Sir: It was remarked by a car-wheel maker who participated in the recent discussion on this subject at the rooms of the Car-Builders' Association, that to guarantee wheels to run 50,000 miles was hard upon the manufacturer; while another wheel-maker, who took part in the same discussion, was ready to give such guarantee, and would pay for all mileage which his wheels failed to make less than 50,000, upon condition that he should be paid for all that they made over that. Here is quite an important difference of opinion among those who ought to know best the qualities of their respective products. The difference in this particular instance may be due to unwarranted distrust on the one hand or over-confidence on the other; but the fact remains that there has been a marked depreciation in the general run of car-wheels within the past twelve years as compared with what they were previously. If this is due, as founders say, to the continued remelting of the iron and its absorption of sulphur from the coal used in smelting, then the sooner our roads cease to exchange old wheels for new ones the better; or perhaps it would be better still to consider the expediency of adopting some other material, of more lasting and durable properties, in place of iron.

As the only substitute for iron is steel, the economy of such a change is worthy of consideration. The steel wheel requires an additional machine for fitting it up, say a double-headed engine-lathe of 40 or 42 inch swing, capable of turning two sets of wheels per day, and costing $4000, which represents so much capital, the interest upon which should be added to the cost of the product. An extra machinist is also required to run the lathe, with sundry incidental expenses for power, tools, oil, depreciation, etc., all of which will figure up at not less than $1.40 for each wheel, which amount is included in the estimate below in the items of turning and depreciation. We assume as a basis for calculation, the cost of steel wheels to the consumer at $50 each, with a guaranteed mileage of 300,000, and chilled wheels at a cost of $18 each, with a guaranteed mileage of 45,000, the annual mileage of each being 15,000, and the total running time 20 years, covering in both cases a mileage of 300,000.

Cost of 1 steel wheel	$50.00
Deterioration, 40 cents a year	8.00
2 turnings, $1 each	2.00
Interest 7 per cent compounded every 3 years	135.48
	$195.48
Cost of 7 new iron wheels at $18	$126.00
6 changes at $1 each	6.00
Interest 7 per cent compounded every 3 years	113.66
	245.66
Deduct 6 old wheels, $7 each	42.00
	$203.66

At this point, or at the close of the 20th year, a difference of $8.18 in cost is shown in favor of the steel wheel, which has some life left in it after completing its guaranteed mileage. The chilled iron wheel has also one year more of service remaining for the 7th wheel, and also the value of the metal when the wheel is worn out. If we add another chilled wheel, making 8 in all, with an additional 4 years' running and 60,000 mileage, and also allow a corresponding addition to the life and mileage of the steel wheel, making 24 years and 360,000 mileage for each, the result will be as follows:

Cost of steel wheel	$254.72
" per mile run	.00708
Cost of iron wheel	$269.04
" per mile run	.00747

If at the end of this time the flanges of the steel wheels have not been cut away so as to make their running unsafe, and if they have been turned only at the end of 150,000 mileages, they may still be capable of further service, and may reach 400,000, this additional life being equivalent to that of another chilled wheel in comparison. These calculations are on the supposition that all the wheels are fairly worn out, and not condemned by reason of flat spots caused by brake-action, to which both steel and iron wheels are liable. That any wheel could run for 27 years without injury from this cause is quite improbable, and if it occurred in steel wheels inside of 20 years, it would be a point in favor of chilled wheels; for it can hardly be assumed that 8 or even 6 of these could all be condemned in succession as an offset to a failure of the steel wheel at the same period of service. If chilled wheels can be brought up to a mileage of 60,000, at the price of $20 per wheel instead of $18, five wheels would then represent a mileage of 300,000 and 20 years' service, and render a better exhibit on the score of economy than steel ones. It is obvious that in estimating comparative results much depends on the mileage taken as a basis for calculation; but 15,000 per year is not far wrong for ordinary car service. A higher average would of course be more favorable to chilled wheels. It is conceded that steel wheels are stronger in all respects and less liable to flange breakage, and that injury from skidding can be remedied by turning off the injured portion of the tread, yet when but one wheel of a pair is thus worn, both must be turned off, which involves a loss of valuable wearing surface.

Steel wheels, on account of their greater strength and safety, are specially adapted to passenger equipment, and should on this account be used without much regard to the matter of cost; but they are not likely to be immediately or very extensively used in freight service, if the mileage of chilled wheels can be increased by the use of better material and the abandonment of the practice of using old wheels in their composition. M.

Purification of Water by Contact with Iron.

Almost all large water-pipes are of iron, as taxpayers well know when they are called upon to replace the old rusty mains with new ones every few years. But, according to good chemical authority, the iron has an advantage with its defects. Professor Medlock proved by analysis, several years ago, that iron by its action on nitrogenous organic matter produces nitrous acid, which Muspratt called "Nature's scavenger." The latter chemist found, as a general result, that, by allowing water to be in contact with a large surface of iron, in about 48 hours every trace of organic matter was either destroyed or rendered insoluble, in which state it could be purified effectually by filtration. Medlock found, on examining the water at Amsterdam, which smelt and tasted badly, that the sediment charred on ignition, and was almost consumed, showing that it consisted of organic matter. He also found that water, instead of taking iron from the service-pipes, before entering them contained nearly half a grain of iron to the gallon; while in the water issuing from the pipes, there was only an unweighable trace. Before entering the reservoir, the water holding iron in solution formed no deposits; while the water coming from the pipes and freed from iron gave organic sediment above mentioned. He then made analysis of water brought in contact with iron, and water not in contact, with the result that the water which had not touched iron contained 2.10 grains of organic matter, and 0.96 grain iron; the other gave only a slight trace of both, showing plainly that the organic matter in the water was either decomposed or thrown down by contact with iron; and this water, when filtered, was found to be clear, of good taste, with no smell, and free from organic matter. It is not stated in what shape the iron was held in solution, but it was probably in that of carbonate, the usual iron salt of springs, since carbonate acid is so common in water in general.—*Ex.*

Gas on Railway-Cars.

On one of the railways in Prussia, the cars have been lighted by gas for about a year. The experiment has been so successful that there is little doubt of the ultimate exclusion of all kinds of oil-lamps on the railways of Germany. The gas is manufactured expressly for the purpose from oil, being a richer hydro-carbon than common street gas. It is compressed to six atmospheres in cylindrical receivers five feet long, and from 16½ to 20 inches in diameter. If more than two receivers are to be connected, the connecting tubes are of one fourth inch bore, very strong. A regulator is introduced intermediate between the burners and the receivers, in which the requisite low pressure is maintained so steadily that all the tremors and shock to which the cars are subject produce no perceptible effect upon it. This regulator consists of a cast-iron circular vessel 10 inches in diameter and 6 inches in height, the open top of which is closed gas-tight by a flexible membrane loosely stretched. The middle point of the membrane is armed with a metal disk, connected with a lever acting on the supply-valve communicating with the gas-holder. The weight of the membrane and its connections is made sufficient to furnish all the pressure needed to maintain the efflux at the burner. When the supply in the regulator is low, the supply-valve is opened by the depression of the membrane. As the gas streams into the regulator, the membrane rises, and the supply-valve is gradually closed. The illumination is thus maintained even more steadily than the gas-jets in the cities, though the pressure in the gas-holders of course gradually falls off. A single holder of six to nine cubic feet capacity will supply a burner for 45 to 67 hours. The intensity of the light, by photometric determination, is equal to that of ten candles, while that of ordinary coal-gas, burnt at the same rate and under similar circumstances, is but about 3½ candles. The burners in actual use give about seven candles light; the Argand lamps usually employed give a light of only four candles. The whole apparatus, except the burners and their protecting lanterns, is placed beneath the cars. There seems to be no possibility of danger from its use, except such as might result from explosion.—*R. R. Register.*

Trial of the Loughridge Brake.

A series of interesting experiments were recently made by the Baltimore and Ohio Railroad to test an improvement recently made by Mr. Loughridge in his brake. The object was to determine in what time and distance a single car could be stopped at high speed, in comparison with the old system when the hand-brakes are used, which was determined by drawing the coupling-pin and separating two cars from the train. The results were that when the pin was pulled and the brakeman signaled to apply the brakes, the car with the new system was stopped when running at a speed of forty-eight miles an hour within a distance of 550 feet, and within 13½ seconds' time, while with the other car it required 1255 feet distance. Several stops were made, which showed great power and a remarkable uniformity of action in the new brake. Mr. Loughridge claims this as the shortest distance in which a car has ever been stopped with hand-power, as some two hundred feet were required to fully apply the power with a brakeman, and that with this improvement the effectiveness of the air-brake will be proportionately increased.

The Pennsylvania Railroad Company has a car built and used expressly for the purpose of testing the correctness of the track-scales along the line. The body of the car is of iron, and it is furnished with weights, by which the scales can be proved. It is started out from Altoona once each month, and makes the round of the road and branches, adjusting all the scales.

The Ranlet Manufacturing Company at Laconia, N. H., has begun work on an order for passenger-cars.

A locomotive, which has been in use on the Cumberland Valley Railroad for thirty-five years, has been retired.

The Southwestern Car-Works at Jeffersonville, Ind., has taken a contract for 100 freight-cars for the Terre Haute & Indianapolis road.

The Patten Car-Works at Bath, Me., have been building several passenger-cars for the St. Francis & Megantic International Railway of Canada.

Mr. George W. Norris, late of the Erie Railway Car-Shops, at Port Jervis, has been appointed foreman of the shops at Carbondale, Pa., on the Jefferson Branch.

The Lehigh Car-Works at Stemton, Pa., are working on an order for 300 coal-cars for the Pennsylvania Railroad, and have also a large order for cars for the New-Jersey Central.

The Boston and Providence Railroad Company has completed its new passenger-depot, in Boston, which is one of the most artistic and beautiful structures of the kind in the country.

The Pullman Pacific Car Company owns 23 sleeping-cars on the Union Pacific road. About 40,000 passengers were carried in them during the past year. This company is distinct from the Pullman Palace Car Company.

Mr. Osgood Bradley, the well-known car-builder, of Worcester, Mass., celebrated his seventy-fifth birthday on the 15th of January by a reception, which was attended by many prominent citizens and a number of railroad men.

The Scofield Rolling Mills at Atlanta, Ga., have received an order for 1000 tons of steel-capped rails for the Mobile and Montgomery road. Further orders for the same class of rails are promised, provided the first lot prove satisfactory.

It is stated that the Jackson & Woodin Manufacturing Company, at Berwick, Pa., has received an order for 500 coal-dumps, 1000 pairs of wheels and axles, 2000 draw-hooks, and a lot of passenger-car wheels, for the Central Railroad of New-Jersey.

Mr. George Chalender has been appointed Superintendent of the Locomotive and Car Department of the Michigan Central Railroad. Mr. Chalender has been the Superintendent of the Locomotive Department of the Chicago, Burlington & Quincy Railroad for the last twenty years, and is considered an expert in his line of business. He was the engineer of the first locomotive that ever ran to Burlington, Ia., and many years ago was Superintendent of the locomotive and car department of the Burlington & Missouri River Railroad.

The *American Manufacturer* says that some of the railroads of this country are pursuing a policy in relaying track that, while it may lessen the present demand for rails, and so keep the mills idle for a little longer, will in the end create a larger demand. A gentleman who has traveled quite extensively on some of the prominent Western roads, reports that in many cases where the rails have worn out and have to be relaid, the ends of the old rails are cut off, and two shorter sections put in in place of the single rail. There may be no danger in this, but we should think it poor policy and expensive. The wear and tear of rolling stock must be very much greater.

The line of railway heretofore known, in its detached and unfinished portions, as the Paris and Decatur; Paris and Terre Haute; Peoria, Atlanta and Decatur, is now complete through its entire length, and has been opened for business between Terre Haute, Ind, and Peoria, Ill., under the name and style of the Illinois Midland Railway. Thoroughly constructed and equipped with every modern appliance for comfort, speed, and safety, it takes its place in the general railway system with a special claim for an interchange of traffic with all connecting lines. It passes through the most fertile and populous region of Illinois. The connection with Indianapolis through the Vandalia Line, brings it at once into close communion with the whole network of railways radiating from that point. The passenger department is under the able management of Charles E. Follett general passenger and ticket agent of the Vandalia Line.

The St. Louis *Railway Register* has been changed from a folio to a 12-page quarto, and otherwise improved in its general appearance. It is the recognized organ of the Southwestern railway and mining interests, and is conducted with ability and enterprise. Price, $3.00 per annum.

The *Railway World*, of Philadelphia, succeeds the *United States Railroad and Mining Register*. It is an attractive and well-printed journal of 16 pages; and judging from its initial numbers, it will prove a valuable exponent of the vast and growing interests it represents. Annual subscription, $4.00.

The *Lumber Trade*, of Boston, and the *Northwestern Lumberman*, of Chicago, have been consolidated under the latter name. As a class journal, it is not surpassed in appearance by any other in the country, and as an organ of the lumber trade, it is worthy of the extensive circulation it has already attained. Published monthly, price $2.50 a year. Judson Dicey & Co., proprietors, 284 Wabash Avenue, Chicago, Ill.

The *South* begins the year with a new and improved dress, and now contains 16 pages. It is specially devoted to the interests of the South and Southwest, and supplies information in regard to climate, soil, productions, and kindred topics, calculated to encourage immigration and business enterprise in that direction. *Crofutt's Western World* has been consolidated with it, but the union involves no change of name in the former journal, which has already won an established reputation and liberal support. Terms, $3.00 a year.

Facetiæ.

England is celebrated for its fogs, France for its frogs, Ireland for its bogs, Canada for its dogs, Maine for its logs, and Ohio for its hogs.

The man who has not any thing to boast of but his illustrious ancestors, is like a potato-plant—the only good belonging to him is under ground.

"Your feet are not very stylish," said a man to his friend whose feet were covered with bunions. "No, not stylish, but exceedingly nobby," was the good-natured reply.

A Canada man tied his dog to the rear car of a train, and then bet the beast could keep up with it Strange to say, when the train reached Detroit, the dog was a-head—there was nothing else left of him.

A citizen of Leavenworth, going to his barn to milk in the dark of the early morning, got into the wrong pen, and undertook to milk a mule. He don't remember which side of the barn he went out at, but expects his bucket down in a few days.

Restaurant chicken-soup is said to be made as follows: Hang up the remains of an old hen or rooster in the sun so the shadow will fall in a pot of boiling water. This will do in sunshiny weather, but on a cloudy day the soup is apt to be weak.

There is a man in Massachusetts who has exploded the popular fallacy that a man has to advertise to succeed in business. He commenced business forty-

seven years ago, with a capital of $800; he hasn't spent a cent in advertising since, and is now worth $805.

AN Irishman found a Government blanket recently, and rolling it up, put it under his arm and walked off, saying: "Yis, that's moin—U for Patrick, and S for McCarthy: be me sowl, but this learnin's a fine thing, as me fayther would say; for if I hadn't any edication I wouldn't have been afther findin' me blanket."

A CLERGYMAN was lately depicting, before a deeply interested audience, the alarming increase of intemperance, when he astonished his hearers by saying, "A young woman in my neighborhood died very suddenly last Sabbath, while I was preaching the Gospel in a state of beastly intoxication."

A WOMAN, an infant, and a bottle of milk, caused a great commotion the other day on an Indiana train when it was running at the rate of forty miles an hour. The bottle dropped out of the window, the mother frantically pulled the bell-cord, stopped the train, and wanted the conductor to go back after the babe's lost sustenance. He didn't go.

A KANSAS girl was standing with her lover, watching, with eyes and mouth agape, the arrival of the first train on a new railroad. The locomotive was quiet until it came into the depot; but when the whistle blew as the engine was stopping, the girl burst out with the exclamation, "Why, dog my cat, if she didn't come plum into the shanty afore she bellered!"

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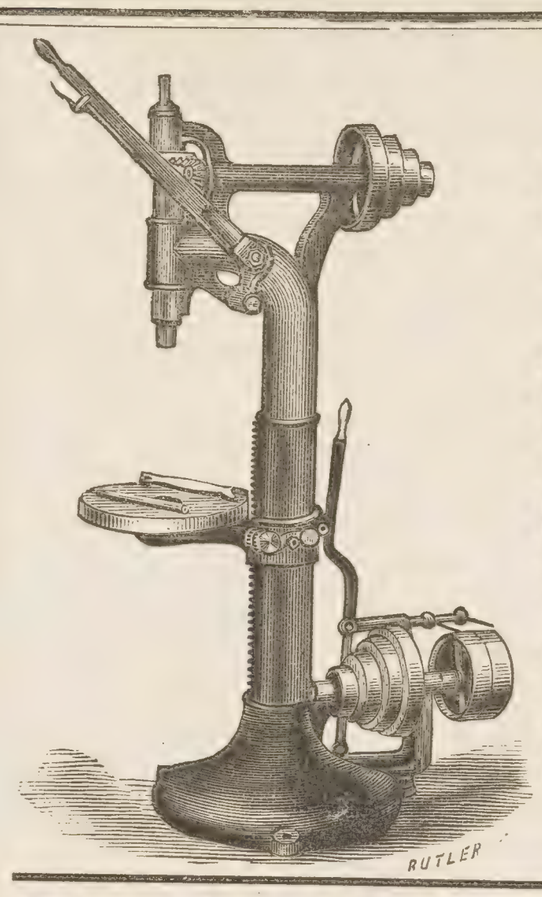
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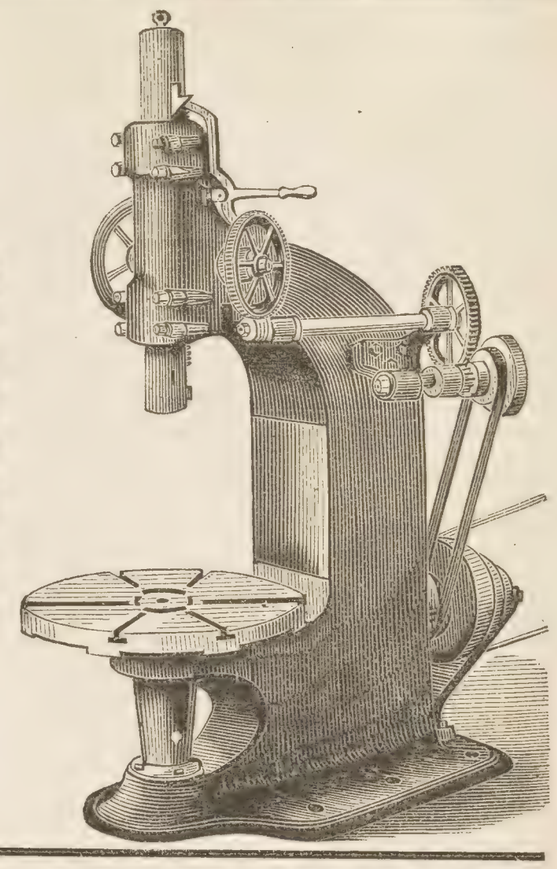


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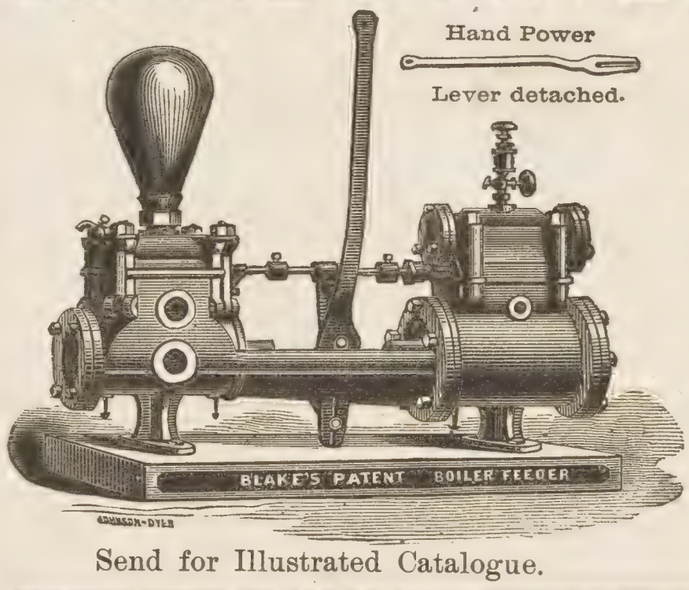
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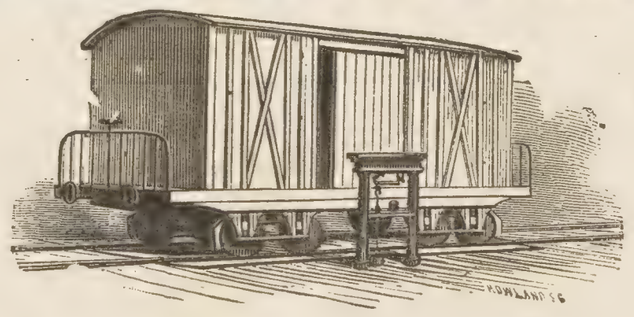
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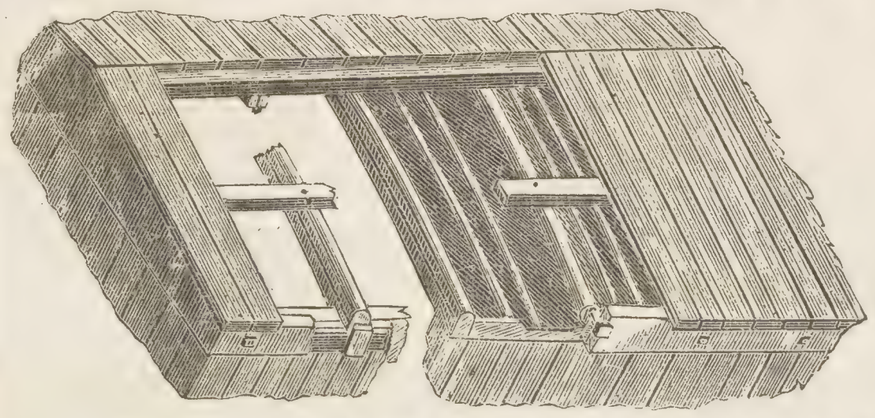
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Davenport & St. Paul	James Russell		Davenport, Iowa.
Dayton & Union	A. J. Keenan	J. F. Feicht	Dayton, Ohio.
Dayton & Michigan	John Black	W. H. H. Allison	Cincinnati, Ohio.
Delaware, Lackawanna & Western	Walter Dawson	Robert McKenna	Scranton, Pa.
Morris & Essex Division	W. H. Lewis	L. S. Barber	Hoboken, N. J.
Denver & Rio Grande	John Greenwood		Denver, Col.
Detroit, Ft. Wayne & Logansport	W. A. Carpenter		Bankers, Mich.
Detroit & Milwaukee	Andrew Wilson		Detroit, Mich.
Detroit, Lansing & Lake Michigan	Tho. E. Roberts		Ionia, Mich.
Delaware & Hudson Canal Co.	‖‖R. C. Blackall		Albany, N. Y.
Dorchester & Delaware			Cambridge, Md.
Dubuque South-Western	James Rollo	James Rollo	Farley, Iowa.
Dutchess & Columbia	W. G. Vanbuskirk	H. A. Webster	Fishkill, N. Y.
Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett	Dunkirk, N. Y.
E			
Eastern		J. P. Somerby	Salem, Mass.
Eastern	John Thompson		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L. Weaver	Riverton, Ky.
East-Tennesee, Virginia & Georgia	C. A. Hodge		Knoxville, Tenn.
Erie Railway	§§Frank K. Hain		Susquehanna, Pa.
Erie Railway	Robert Wallace		Susquehanna, Pa.
Erie Railway	V. Blackburn		Jersey City, N. J.
Erie Railway	F. M. Wilder	M. Wilder	Buffalo, N. Y.
Erie Railway	J. W. Chapman	J. W. Chapman	Hornellsville, N. Y.
Erie Railway		‖D. B. Goodell	Elmira, N. Y.
Erie Railway		‖J. B. Hill	Jersey City, N. J.
Erie Railway	J. Van Vechten	‖J. Van Vechten	Port Jervis, N. Y.
Erie Railway	A. T. Back		Rochester, N. Y.
Erie & Pittsburg	G. J. Parkin	G. J. Parkin	Erie, Pa.
European & North Am. (of Maine)	A. O. Bailey	J. H. Brown	Oldtown, Maine.
Evansville & Crawfordsville	John L. White	Joseph Stiker	Evansville, Ind.
Evansville, Terre Haute & Chicago	§§Wm. Riley, Jr.		Terre Haute, Ind.
F			
Fitchburgh	Geo. A. Cooledge	Enos Varney	Charlestown, Mass.
Fitchburgh & Worcester	John Webster	Samuel Stevens	Fitchburg, Mass.
Flint & Pere Marquette	Sanford Keeler	‖R. B. More	East-Saginaw, Mich.
Florida	Ezra Gray	G. Hernandez	Fernandina, Fla.
Flushing & North Shore	Wm. La Suer	C. Wilkinson	Hunter's Point, L. I.
G			
Galveston, Harrisburgh & San Antonio	Palmer Cady		Harrisburgh, Texas.
Galveston, Houston & Henderson	Jno. G. Coulon	Wm. Macbeth	Galveston, Texas.
Georgia	William Hardman	T. M. Preval,	Augusta, Ga.
Gilman, Clinton & Springfield	W. B. McKenna		Springfield, Ill.
Grand Tower & Carbondale.	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk		Warren Noyes	Gorham, Me.
Grand Trunk	†Herbert Wallis	Wm. McWood	Montreal, Canada.
Grand Trunk			Sherbrooke, Can.
Grand Trunk		B. J. Mitchell	Portland, Me.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne, Ind.
Great Western of Canada	†Wm. A. Robinson	F. Childs	Hamilton, Canada.
Green Bay & Lake Pepin	J. H. Erwin		Green Bay, Wis.
Greenville & Columbia	R. H. Anderson	R. H. Anderson	Helena, S. C.
H			
Hackensack & New-York	Abra'm Angausen		Hackensack, N. J.
Hanover Branch	John J. Bingley	Henry Britcher	Hanover, Pa.
Hannibal & St. Joseph	**Jno. MacKenzie		Hannibal, Mo.
Hartford, Providence & Fishkill	Edwin Garfield	V. D. Perry	Hartford, Ct.
Housatonic	C. R. Morris.	J. J. Ferris	Falls Village, Ct.
Houston & Texas Central	L. C. Noble	James McGee	Houston, Texas.
Huntington & Broad-Top Mountain	W. W. Coller	M. Tellerhoof	Saxton, Pa.
I			
Illinois Central	**S. J. Hayes	W. B. Snow	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia, Ill.
North Division	J. B. Edams		Amboy, Ill.
Iowa Division	Thomas W. Place		Waterloo, Iowa.
Illinois Midland	J. G. Clifford	G. Clifford	Paris, Ill.
Illinois & St. Louis.	James Hazen		Bellville, Ill.
Indianapolis, Cincinnati & Lafayette	J. S. Patterson	S. Griffith	Cincinnati, Ohio.
Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Indianapolis & St. Louis	A. J. Sanborn		Mattoon, Ill.
Indianapolis, Bloomington & Western	Tho. V. Losee	A. J. Allen	Urbana, Ill.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ia.
International & Great Northern	R. B. Small		Palestine, Texas.
Intercolonial	Wm. Whitney	Edw. Shaffer.	Moncton, N. B.
Iron	Perry Scott	Clem. Roetling	Ironton, Ohio.
Ithaca & Athens	F. A. Brown		Ithaca, N. Y.
J			
Jacksonville, Pensacola & Mobile	H. D. Kennedy		Jacksonville, Fla.
Jeffersonville, Madison & Indiana	Reuben Wells		Jeffersonville, Ind.
Junction & Breakwater	J. A. Maguire.		Lewes, Del.
K			
Kalamazoo, Allegan & Grand Rapids			Kalamazoo, Mich.
Kansas City, St. Joseph & Council Bluff	Wm. D. Rowley	Wm. D. Rowley	St. Joseph, Mo.
Kansas Central	John Davis		Leavenworth, Kan.
Kansas Pacific	**L. H. Waugh		Wyandotte, Kansas.
Denver Pacific Div	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div.	**L. H. Waugh		Wyandotte, Kansas.
Junction City & Ft. Kearney Div	**L. H. Waugh		Wyandotte, Kansas.
Arkansas Valley Div	**L. H. Waugh		Wyandotte, Kansas.
Kentucky Central	J. R. Ledyard	J. L. Hackathorn	Covington, Ky.
Keokuk & Des Moines Valley	S. W. Wakefield	M. Sessions	Keokuk, Iowa.
King's Mountain	E. Thomas	E. Thomas	Chester, S. C.
Knox & Lincoln	§§E. R. Hamlin	Benj. Soule	Bath, Me.
Knoxville & Charleston			Knoxville, Tenn.
L			
Lackawanna & Bloomsburg	Chas. Graham	Chas. Graham	Kingston, Pa.
Lake Erie & Louisville	John Pero		Fremont, Ohio.
Lake Ontario Shore	Wm. Harris		Oswego, N. Y.

Railroad.	Master-Mechanic.	Master Car-Builder.	Residence.
Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland, Ohio
Michigan Southern Division	Geo. W. Stevens		Elkhart, Ind.
" " "		S. S. Knapp	Adrian, Mich.
Toledo Division	Albert Congdon	Frank O. Bray	Norwalk, Ohio.
Erie Division	L. O. Gassett	J. Withyecombe	Cleveland Ohio.
Buffalo Division	W. L. Wallace	A. C. Robson	Buffalo, N. Y.
Lake Superior & Mississippi			St. Paul, Minn.
Lake Shore & Tuscarawas Valley	W. F. Turreff		Black River, Ohio.
Lehigh Valley	John I. Kinsey		South-Easton, Pa.
Lehigh Valley	P. Hofecker	E. R. Brown	Weatherly, Pa.
Lehigh Valley	A. Mitchell	Mauch Chunk, Pa.	Delano, Pa.
Lehigh Valley	D. Clark		Hazleton, Pa.
Leavenworth, Lawrence & Gal	J. S. McCrum		Lawrence, Kansas
Little Rock & Fort Smith	D. R. Wing	D. R. Wing	Argenta, Ark.
London & Port Stanley			London, C. W.
Louisville, New-Albany & Chicago	Geo. Ruhlandt	Geo. Helfrich	New-Albany, Ind.
Long Island	Chs. A. Thompson	C. A. Thompson	Hunter's Point, L I.
Louisville, Cincinnati & Lexington	S. S. Pilson	S. S. Pilson	Louisville, Ky.
Louisville & Nashville	†Thatcher Perkins		Louisville, Ky.
Louisville & Nashville	D. P. Rennie	Isaac M. Owens	Louisville, Ky.
Louisville & Nashville	Jas. Montgomery		Bowling Green, Ky.
Nashville & Decatur Division	John Skidmore		Nashville, Tenn.
South & North Ala. Div.	Thos Jeffers	W. L. Gude	Birmingham, Ala.
South & North Ala. Div	C. H. Beale		Montgomery, Ala.
Memphis & Ohio Div.	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Louisville, Paducah & So. Western	W. D. Robb	F. A. Felton,	Elizabethtown, Ky

M

Macon & Augusta			Macon, Ga.
Macon & Brunswick	R. Wagnon	R. Wagnon	Macon, Ga.
Macon & Western	D. M. Gogel	James A. Knight	Macon, Ga
Maine Central	J. W. Philbrick	J. W. Philbrick	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div	John Ellis	C. H. Kenison	Augusta, Me.
Maine Central Division	John F. Merrill.		Waterville Me.
Manchester & Lawrence	Chas. L. Eastman.	M. W. Dickerman.	Concord, N. H.
Marietta, Pittsburg & Cleveland	W. J. Adams		Marietta, Ohio.
Marietta & Cincinnati	E. Bosley	E. Bosley	Chillicothe, Ohio.
Marquette, Houghton & Ontonagon		H. D. Lyons	Marquette, Mich.
Maryland & Delaware	Samuel Peters		Greensboro, Md.
Memphis & Little Rock	Tho. Rennell	P. Twitchell	Argenta, Ark
Memphis & Charleston	A. Ross	A W. Drew	Memphis, Tenn.
Memphis & Charleston	H. N. Burford	Fabien Varin	Huntsville, Ala.
Mineral Point	Robert Hay	Robert Hay	Mineral Point, Wis.
Mineral Range	C. H. Fox		Hancock, Mich.
Mississippi & Tennessee	Geo. Haszinger	J. Riny	Memphis, Tenn.
Michigan Central	§§Geo. S. Chalender.	Geo. S. Chalender	Jackson, Mich.
Michigan Central		‖Henry Whiting	Detroit, Mich.
Midland Pacific	A. C. Stiles		Lincoln, Neb
Mississippi Valley & Western	J. S. Pickering		Canton, Mo.
Missouri, Iowa & Nebraska	J. G. Crozier		Alexandria, Mo.
Missouri, Kansas & Texas	T. G. Gorman		Parsons, Kan.
Missouri, Kansas & Texas		J. Townsend	Sedalia, Mo.
Missouri, Kansas & Texas	J. E. Wiggins		Hannibal, Mo.
Missouri River, Fort Scott & Gulf	John S. McCrum	Alex. Montier	Kansas City, Mo.
Missouri River, Fort Scott & Gulf		Josiah Stahl	Wyandotte, Kan.
Mobile & Montgomery	James McFarland.	L. Barham	Montgomery, Ala.
Mobile & Girard	C. D. Wall		Girard, Ala.
Mobile & Ohio		John McHugh	Mobile, Ala.
Mobile & Ohio	R. McDougal	I. T. Booth	Whistler, Ala.
Mobile & Ohio	B. S. Herring		Macon, Miss.
Mobile & Ohio	R. H. Briggs		Jackson, Tenn.
Montgomery & West-Point	J. McVey	J. T. Daniels	Montgomery, Ala.
Montgomery & Eufaula	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Algiers, La.
Montreal Northern Colonization	§§C. G. C. Simpson		Montreal, Can.

N

Nashville & Chattanooga	John U. Eastman	J. G. Sawyer	Nashville, Tenn.
Naugatuck	Henry Hanford	George W. Gray	Bridgeport, Ct.
New-Bedford	G W. Reynolds	Robert Chase	Taunton, Mass.
New-Brunswick	P. Logan	C. M. Kinnon	Fredericton, N. B.
New-Brunswick & Canada	Tho. Armstrong	G. Houlton	St. Andrew's, N. B.
New-Haven & Northampton	Henry Fox	Henry Fox	New-Haven, Ct.
New-Jersey Midland	C. J. Clifford		Wortendyke, N.J.
New-Jersey Southern	Rufus Blodgett.		Manchester, N. J.
New-Orleans & Ohio	John R. Jordan	John R. Jordan	Paducah, Ky.
New-Orleans, St. Louis & Chicago		‡‡J. D. Billings	McComb City, Miss.
New-Orleans, St. Louis & Chicago	§§L. H. Sellars		Water Valley, Miss.
New-Orleans, Mobile & Texas	H. C. Knapp	D. C. Roland	Mobile, Ala.
New-York, Kingston & Syracuse	A. Q. Mackenbush.	G. Dikeman	Syracuse, N. Y.
New-York & Harlem	Wm. M. Strong	C. E. Garey	New-York.
New-York Central & Hudson River		††Leander Garey.	New-York.
New-York Central Division	‡G. B. Van Vorst	D. Hoit	West-Albany, N. Y.
New-York Central Division	Henry Watkeys.		Syracuse, N. Y.
New-York Central Division	Amos Gould	James Leary	Rochester, N. Y.
New-York Central Division	Jas. Butman	Wm. Johnson	Buffalo, N. Y.
New-York Central Division	S. L. White	George Rowe	Niagara Falls, N. Y
Hudson River Division	‡Wm. Buchanan.	E. A. Olmstead.	New-York City.
Hudson River Division	R. Greenalch	J. J. Conaghty	E. Albany, N. Y.
New-York, Boston & Montreal	W. G. Van Buskirk	H. A. Webster	Dutchess Junc., N.Y
New-York & Oswego Midland	§§W. S. Dripps		Oswego, N. Y.
Eastern Division	J. Minchell	J. Minchell	Middletown, N. Y.
Middle Division	Tho. Howard		Norwich, N. Y.
Northern Division	Edward Van Vleck.	T. D. Day	Oswego, N. Y.
New-York & New-England	Geo. E. Boyden	Elias E. Pratt	Boston, Mass.
New-York, Providence & Boston.	Jas. H. Anderson.	Jas H. Anderson.	Providence. R. I.
New-York, New-Haven & Hartford	§§H. Kittendorf	James Denver	New-Haven. Ct.
New-York, New-Haven & Hartford	J. O. Chapman	F. Leppens	Hartford, Ct.
Northern Central	C. M. Lewis		Baltimore, Md.
Northern Central		G. W. Demarest.	York, Pa.
Northern New-Hampshire	James W. Lander.	Albert Langmaid.	Concord, N. H.
Northern of Canada	P. Clark.	P. Clark	Toronto, Can.
Northern Pacific	**H. A. Towne		St. Paul, Minn.
Minnesota Division	W. H. Lewis	W. S. Heathcote	Brainerd, Minn.
Lake Superior & Miss. Div	G. H. Smith	John Hill	St. Paul, Minn.
Dakota Division	C. W. Rossiter		Fargo, D. T.
Pacific Division	J. F. Curtis		Kalama, W. T.
North-Carolina	Rufus D. Wade	B. G. Sergeant	Co. Shops, N. C.
North-Louisiana & Texas	C. H. Tull		Monroe, La.
North-Lebanon		Henry B. Oves	Lebanon. Pa.
North-Pennsylvania	Franklin Roop	Franklin Roop	Philadelphia, Pa.
North-Eastern	D. W. Haines	A. M. Corrie	Florence, S. C.
Norwich & Worcester	Richard Colburn	G. R. Bentley	Norwich, Ct.

O

Ohio & Mississippi		G. Hibbert	Cochran, Ind.
East Division	A. Thompson		Seymour, Ind.
West Division			East St. Louis, Ill.
Oil City & Pithole	George Thompson		Pithole, Pa.
Oil Creek & Alleghany River	H. J. Bookhammer.	John Monks	Oil City, Pa.
Old Colony & Newport	J. K. Taylor	A. Gleason	Boston. Mass.
Oregon & California	§§J. Brandt.		Portland, Oregon.
Owensburg & Russellville	J. R. Osborne		Owensburg, Ky.

P

Paducah & Memphis	Alex. Forsyth		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Panama	Chas. E. Stewart		Aspinwall, N. G.
Pacific of Missouri	§§John Hewitt	E. Martin	St Louis, Mo.
Pennsylvania	§§T. N. Ely		Altoona, Pa.
Pennsylvania	H. D. Garrett	I. W. Van Houten.	W. Philadelphia, Pa.
Pennsylvania	E. L. Caum	Samuel W. Myers.	Harrisburg, Pa.
Pennsylvania	G. W. Strattan	John P. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver	R. S. Ramsey	Pittsburg, Pa.
New-Jersey Division		David H. Baker	Jersey City. N. J.
West-Penn. Division	C. B. Street	M. H. Fales	Blairsville, Pa.
Peoria & Rock Island	Geo. Gregg		Peoria, Ill.
Peoria, Pekin & Jacksonville	R. F. Hurd	Jas. J. Doyl	Pekin, Ill.
Petersburg & Weldon	R. B. Andrews	Alex. Wright	Petersburg, Va.
Philadelphia, Wilmington & Baltimore	S. A. Hodgman.	Wm. T. Worth	Wilmington, Del.
Philadelphia & Baltimore Central	S. D. Danfield	Samuel D. Danfield	Chester, Pa.
Philadelphia and Erie	Martin Walls		Sunbury, Pa.
	W. L. Forster		Renovo, Pa.
	W. L. Holman		Kane, Pa.
	W. T. Smith.		Erie, Pa.
	§§Howard Fry		Erie, Pa.
Philadelphia & Reading	L. B. Paxson	Aaron Steinbach.	Reading, Pa.
Germantown & Norris'n Div	Jackson Richards		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis	E. Pierce		Dennison, Ohio.
Pittsburg & Columbus Division		Thos. D. Furgusen.	Steubenville, Ohio.
Little Miami Division		M. P. Ford	Columbus, Ohio.
Little Miami Division	J. H. Setchel		Cincinnati, Ohio.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlin	Columbus, Ohio.
Col., Cin. & Ind. Division	Geo. H. Prescott	Geo. H. Prescott	Logansport, Ind.
Pittsburg, Fort Wayne & Chicago	S. M. Cummings	John Marquis	Allegheny, Pa.
Pittsburg, Fort Wayne & Chicago	J. M. Boon.	Israel Lee	Fort Wayne, Ind
Pittsburg, Fort Wayne & Chicago		J. J. Kirkland	Crestline, Ohio.
Pittsburg, Virginia & Charlston	W. Lininger		Pittsburg, Pa.
Pittsburg, Washington & Baltimore	§Wm. Stearns		Connellsville, Pa.
Pittsburg, Washington & Baltimore	J. E. Sampsel	J. M. Leach	Pittsburg, Pa.
Portland & Rochester	John G. Brady	John G. Brady	Portland, Me.
Portland & Oxford Central	Geo. W. Battles	Geo. W. Battles.	Buckfield, Me.
Portland, Saco & Portsmouth	John Donnell		Portland, Me.
Port Royal	Wm. Campbell	E. Hubard	Port Royal, S. C
Port Hope. Lindsay & Beaverton	H. G. Taylor	H. G. Taylor	Port Hope, Can.
Portsmouth. Gt. Falls & Monmouth	James Tucker	E. Fall	Union Village, N.H.
Poughkeepsie & Eastern	John L. Driscoll	Jerry Wigg	Poughkeepsie, N. Y.
Providence & Worcester.	Joseph Kelly	Olney L. Smith	Providence, R. I.
Providence, Warren & Bristol	Rufus Smith	J. Brightman	Bristol, R. I.

Q

Quincy, Alton & St. Louis	J. O. Gravell	W. G. Gilbert	Quincy, Ill.
Quincy, Missouri & Pacific			Quincy, Ill.

R

Raleigh & Gaston.	B. R. Harding	B. R. Harding	Raleigh, N. C.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Richmond, Fredericksburg & Potomac	H. Kuhn	W. H. Trainham	Richmond, Va.
Richmond, Danville & Piedmont	John McFarland	J. B. Vaughan	Richmond, Va.
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond, Va.
Richmond & York River	C. H. Harris	J. L. Thompson	Richmond, Va.
Rive De Loup	P. A. Logan	C. R. McKinnin	Fredericton, N. B.
Rome, Watertown & Ogdensburg	Abram Klohs	H. H. Sessions	Rome, N. Y.
Rome, Georgia	O. W. Harbin	O. W. Harbin	Rome, Ga.
Rochester & Genesee Valley	M. E. Brown	M. Wilder	Buffalo, N. Y.
Rockford, Rock Island & St. Louis	Joseph Elder	T. F. Nolte	Beardstown, Ill.

S

Saginaw Valley & St. Louis	W. S. Thompson		Saginaw, Mich.
San Antonio & Mexican Gulf	W. T. Bingham		Victoria, Texas.
Savannah & Charleston	P. J. Hutson	J. D. Murphy	Charleston, S. C.
Seaboard & Roanoke	§§M. M. Pendleton		Portsmouth, Va.
Selma & Gulf	Wm. T. Laughtrey		Selma, Ala.
Selma, Rome & Dalton		W. W. Peirce	Selma, Ala.
Selma, Marion & Memphis	R. H. Anderson		Marion, Ala.
Sheboygan & Fond du Lac	John Hickey	John Hickey	Sheboygan, Wis
Sioux City & Pacific	C. H. Foster		Missouri Val., Iowa.
Southern Pacific of California	J. P. Wilson	F. N. Bellisle	San Francisco, Cal.
South-Carolina	W. B. Smith	John Reed	Charleston, S. C.
Southern Central	Chas. G. Brown	H. Mooney	Auburn, N. Y.
Southern, of Long Island	Mark Brear	C. Wilkinson	Brooklyn, N. Y.
Southern Minnesota			Wells, Minn.
South-Western of Georgia	C. D. Wall		Columbus, Ga.
South-Western of Georgia	D. M. Gogel	James A. Knight	Macon, Ga.
South Shore	Warren E. Ray		Cohasset, Mass.
South Side of Long Island	A. P. Doane	A. P. Doane	Williamsburg, L. I.
Spartanburg & Union	J. N. Benner	Jacob Rice	Union C. H., S. C
Springfield, Athol & Northeastern	W. E. Granger		Springfield, Mas.
Springfield, Illinois & So. Eastern	John W. Warren		Pana, Ill.
Stanstead, Shefford & Chambly	W. H. Smith		Waterloo, C. E.
Stockton & Ione		W. T. Hoyt	Stockton, Cal.
Stonington & Providence	J. H. Anderson	J. H. Anderson	Providence, R. I.
St. Croix & Penobscot	Edward Bolton	A G. Page	Milltown, Me.
St. Joseph & Denver City	E. Sleppy		St. Joseph, Mo.
St. Lawrence & Ottawa	Calvin Dame.	Calvin Dame.	Prescott, Canada.
St. Louis, Iron Mountain & Southern	O. A. Haynes	Oscar Doolittle	Carondelet, Mo.
Arkansas Division	L. Finlay	L. Finlay	Little Rock, Ark.
St. Louis, Vandalia, T. Haute & Ind	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Indianapolis Division	Wm. Riley		Terre Haute, Ind.
Vandalia Division	A. J. Sanborn.		Effingham, Ind.
St. Louis, Alton & Terre Haute	**Beriah Warren		St. Louis, Mo.
St. Louis & South-Eastern	‖‖L. B. Salisbury		Mt. Vernon, Ill.
Nashville Division	‖H. H. Osborne		Edgefield, Tenn.
St. Paul & Pacific	J. C. Monroe	T. W. Heathcote	St. Paul, Minn.
St Paul & Sioux City	F. C. Butterfield	J. W. Lydic	Shakopee, Minn.
St. Louis, Kansas City & Northern	W. H. Selby	C. S. Buck	Moberly, Mo.
Sullivan & Erie			Tonawanda, Pa.
Syracuse, Binghamton & New-York	H. H. Dawson	David Burling	Syracuse, N. Y.
Syracuse Northern	W. Garrison	L. W. Smith	Syracuse, N..

T

Terre Haute & Indianapolis	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Tennessee & Pacific	William McKeand.	William McKeand.	Nashville, Tenn.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	J. A. Hanglin		Marshall, Texas
Tioga	Peres Bonny	D. H. Stratton	Blossburg, Pa
Toledo, Peoria & Warsaw	W. O. Hewitt	R. M. Hemphill	Peoria, Ill.
Toledo, Wabash & Western	§J. B. Morse		Fort Wayne, Ind
Toledo, Wabash & Western	‖John C. Wills.		Lafayette, Ind.
Toledo, Wabash & Western	Jacob Johann		Springfield, Ill.
Toledo, Wabash & Western		U. H. Kohler	Toledo, Ohio.
Toronto, Grey & Bruce.	Wm. Bowstead		Toronto, Can.
Toronto & Nipissing	J. Haggus		Toronto, Canada.
Troy & Boston	Foster Church	R. V. Coon	Troy, N. Y.

U

Union Pacific	§I. H. Congdon	‡‡Geo. E. Stevens	Omaha, Nebraska.
Eastern Division		‖A. M. Collett	Omaha. Neb.
Eastern Division		‖H. P. Makely	Grand Island, Neb.
Mountain Divison		‖Jno. E. Davis	Cheyenne, W. T.
Laramie Division		‖Floyd Heavaner	Laramie, W. T.
Western Division		‖C. A. Phipps	Evanston, U. T.
Utah Central	Thos. Pierpont	Thos. Pierpont	Salt Lake City.
Utica & Black River	John Bailey	David James	Utica, N. Y.
Utica, Chenango & Susquehanna	C. H. Brown		Utica, N. Y.

V

Vermont Central	J. M. Foss	J. M. Foss	St. Albans, Vt.
Harlem Extension Div	C. S. Clapp	C. S. Clapp	Bennington, Vt.
New-London Northern Division	J. W. Dow	S. W. Caulkins	New-London, Ct.
Ogdensburg & L. Champlain Div.	William A. Short	J. R. Ames	Malone, N. Y.
Rutland Division	N. L. Davis		Rutland, Vt.
Vermont & Massachusetts		Jacob Marsh	Fitchburg, Mass
Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.

W

Wash. City, Va. Midland & Gr. Southern	—— Waddy	J. T. Nalls	Alexandria, Va.
Washington & Ohio	Edward Dunn	Joshua Harrison	Alexandria, Va.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Welland	James Taylor	James Chase	St. Catharine, C. W.
Westchester & Philadelphia	John Moyer	N. Pawling	Philadelphia, Pa.
Western & Atlantic	John H. Flynn	Wm. Grambling	Atlanta, Ga.
Western Maryland	Wm. Lannan	J. H. Nussear	Union Bridge, Md.
Western North-Carolina	J. D Hollister	J. D. Hollister	Salisbury, N. C.
Western R. R. N. C	M. W. Atkinson	M. W. Atkinson	Fayetteville, N. C.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
West-Feliciana	R. C. Brower	Wm. Grawling	Woodville, Miss.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
West-Wisconsin	L. T. Mead	J. L. Adam	Hudson, Wis.
White Water Valley	A. W. Britton		Harrison, Ohio.
Wilmington, Columbia & Augusta	W. H. Turrintine		Wilmington, N. C.
Wilmington & Weldon	John Bissit	C. R. Clowe	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Wilmington & Reading	H. M. Missimer		Reading, Pa.
Winona & St. Peter	F. C. Ford	H. L. Preston	Winona, Minn.
Wisconsin Central	G. Campbell		Stevens' P't, Wis.
Worcester & Nashua	Albert Griggs.	Albert Griggs	Worcester, Mass

DIRECTORY
OF
Railway Superintendents and Purchasing Agents
THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director. ‡ Ass't. Gen. Supt. § Ass't Supt.

A

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Arkansas Central	James A. Tappan		Helena, Ark.
Alabama Central	John M. Bridges		Selma, Ala.
Albany & Susquehanna	*C. F. Young		Honesdale, Pa.
Atchison, Topeka & Santa Fe	C. F. Morse	C. F. Morse	Topeka, Kansas.
Atchison & Nebraska	J. F. Barnard	J. F. Barnard	St. Joseph, Mo.
Alabama & Chattanooga	L. J. Fleming	L. J. Fleming	Meridan, Miss.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Pittsburg, Pa.
Atlanta & Richmond Air Line	R. Y. Sage		Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	R. B. Browne	Meadville, Pa.
First Division	J. T. Odell		Meadville, Pa.
Second Division	A. L. Dunbar		
Third and Fourth Division	T. A. Phillips		Galion, Ohio.
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.
Allegheny Valley	J. J. Lawrence	John L. Awl	Pittsburg, Pa.
Adirondack	C. H. Ballard		Saratoga, N. Y.

B

Baltimore & Ohio	Thos. R Sharp	Benj. Williams	Baltimore, Md.
Central Ohio & Lake Erie Div	Wm. Walker		Columbus, Ohio.
Baltimore & Potomac	Geo. C. Wilkins		Baltimore. Md.
Bangor & Piscataquis	M. H. Angel	L. H Eaton	Bangor, Maine.
Boston, Barre & Gardner	I. N. Ross		Worcester, Mass.
Boston, Hartford & Erie	H. A. G. Pomeroy		Boston, Mass.
Boston & Albany	*Wm. Bliss		Boston, Mass
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & Providence	A. A. Folsom	A. A. Folsom	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood		Fitchburg, Mass.
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A Dodge	Lyon & Vose	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood	Boston, Mass.
Boston, Lowell & Nashua	W. M. Parker.		Boston, Mass.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Brunswick & Albany	C. L Schlatter		Brunswick, Ga.
Burlington & Missouri River (in Neb.)	Wm Irwin.		Plattsmouth, Neb.
Burlington, Cedar Rapids & Minnesota	W W. Walker	S. L. Dows	Cedar Rapids, Ia.
Burlington & South-Western	R. T. Hosford		Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. H. Potter	N. M. Whitside	Corry, Pa.

C

Cairo & St. Louis	J. L. Hinkley	C. Ritsema	St. Louis, Mo.
Cairo & Vincennes	Henry L. Morrill		Cairo, Ill.
Camden & Atlantic	§F. A. Lister	J. L. Wendell	Camden, N. J.
Canada Central, Brockville, & Ottawa	H. P. Alden		Brockville, Can.
Canada Southern	*L. D Rucker		Toledo, Ohio.
Canada Southern	Webster Snyder	E. W. Porter	St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua, Pa.
Cayuga Lake	J. L. Grant		Ithaca, N. Y.
Central Branch Union Pacific	W. F. Downs	W. F. Downs	Atchison, Kan.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Central Pacific	‡John Corning		Sacramento, Cal.
Western Division	E. C. Fellows		Lathrop, Cal.
Visalia Division	E. C. Fellows		Lathrop, Cal.
Truckee Division	Frank Free		Truckee, Cal.
Humboldt Division	R. S. Matteson		Carlin, Nevada.
Oregon Divison	J. A. Fillmore		Sacramento, Cal.
Sacramento Division	J. A. Fillmore		Sacramento, Cal.
Salt Lake Division	R. H. Pratt		Ogden, Utah.
California Pacific Division	A. D. Wilder		Vallejo, Cal.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	Thos. Dodamead	J. A. Netherland	Richmond, Va.
Middle Division	H. D. Chapin		Staunton, Va.
Charlotte, Columbia & Augusta	James Anderson		Columbia, S. C.
Cheshire	R. Stewart	H. H. Stone	Keene, N. H.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt	R. W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	J. B. Mulliken.		Escanaba, Mich.
Madison Division	C. A. Swineford.		Baraboo, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis.
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver.		Clinton. Iowa.
Western Iowa Division	John A. Head		Boone, Iowa.
Chicago & Alton.	J. C. McMullen	A. V. Hartwell	Chicago, Ill.
Chicago, Burlington & Quincy	R. Harris	H. J. Higgins	Chicago, Ill.
Chicago Burlington & Quincy	‡C. H Hudson		Chicago, Ill.
Eastern and Middle Division			Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division.	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota.	C. Harris	F. I. Massey	Dubuque, Iowa.
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	*G. S. Bowen	Alfred Penny	Chicago, Ill.
Chicago & Paducah			Streator, Ill.
Chicago, Rock Island & Pacific.	Hugh Riddle.	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chciago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.
Chicago & Michigan Lake Shore	*Geo. C. Kimball	Wm. R. Morrison	St. Joseph, Mich.
Chicago, Danville & Vincennes	L. Pearson	C. B. Mansfield	Chicago, Ill.
Chicago, Milwaukee & St. Paul	*S S. Merrill	J. J. Slocum	Milwaukee, Wis.
Chicago, Pekin & Southwestern	W. P. Sisson		Streator, Ill.
Chicago & Canada Southern	D. Edwards		Toledo, Ohio.
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.
Cincinnati & Muskingum Valley	C. C. Wait		Zanesville, O.
Cincinnati, Richmond & Chicago	Lewis Williams		Cincinnati, Ohio.
Cincinnati & Martinsville	T. C. Burnside		Franklin, Ind.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Cincinnati & Terre Haute			Terre Haute, Ind.
Cin., Cumberland Gap & Charleston	W. J. Taylor		Knoxville, Tenn.
Cincinnati Hamilton & Dayton	Lewis Williams	P. Hickey	Cincinnati, Ohio.
Cincinnati, Hamilton & Indianapolis	Lewis Williams		Cincinnati, Ohio.
Cincinnati, Lafayette & Chicago	E. H. Waldron	G. G. Hadley	Lafayette, Ind.
Cincinnati, Sandusky & Cleveland	*D. W. C. Brown		Sandusky, Ohio.
Cleveland, Columbus, Cincinnati & Ind.	E. S. Flint		Cleveland, Ohio.
Indianapolis Division	C. C. Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division.	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Cleveland, Mt. Vernon & Delaware	G. A. Jones		Mt. Vernon, Ohio.
Colorado Central	P. J. Nichols		Golden, Col.
Columbus & Hocking Valley	M. M Green		Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H.E.Chamberlin	H. E. Chamberlin	Concord, N. H.
Connecticut River	John Mulligan	John Mulligan	Springfield, Mass.
Connecticut & Passumpsic Rivers	Geo. A. Merrill	Geo. Killey	Lyndonville, Vt.
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Corning, Cowanesque & Antrim	A. H. Gorton	R. J. Burnham	Corning, N. Y.
Cumberland Valley	I. F. Boyd	I. F. Boyd	Chambersburg, Pa.
Cumberland & Pennsylvania	J. A. Millholland		Mt. Savage, Md.

D

Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	J. R. Meckling	J. R. Meckling	Sioux City, Iowa.
Davenport & St. Paul	N. H. Wood		Davenport, Iowa.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware & Hudson Canal Co	*C. F. Young		Honesdale, Pa.
Albany & Susq. Division	H. S. Morse		Oneonta, N. Y.
Rensselaer & Saratoga Div	H. B. Smith		Troy, N. Y.
Delaware, Lackawanna & Western		G.W. B. Cushing	New-York City.
Delaware, Lackawanna & Western	W. F. Halstead		Scranton, Pa.
Morris & Essex Division	Andrew Reasmer		Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus. Division	George F. Thompson		Utica, N. Y.
Denver & Rio Grande	W. W. Borst	W. S. Jackson	Denver, Col.
Detroit & Bay City	T. B. Sargent	D. A. Waterman	Detroit, Mich.
Detroit and Milwaukee	W. K. Muir	John S. Lorimer	" "
Detroit, Hillsdale & Indiana	W. F Parker		Ypsilanti, Mich.
Detroit, Ecl River & Illinois	A. B. Southard		Denver, Ind.
Detroit, Lansing & Lake Michigan	A. H. Reese	C. D. Childs	Detroit, Mich.
Dorchester & Delaware	J. M. Murphy		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer	C. V DeForest	Dunkirk, N. Y.
Dubuque & South-Western.	J. P. Farley		Dubuque, Iowa.

E

East Alabama & Cincinnati	B Boyle		Opelika, Ala.
East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern (Mass.)		C. W. Pratt	Boston, Mass.
Erie	E. S. Bowen		New-York City.
Erie & Pittsburg	J. M. Kimball		Erie, Pa
Erie Railway,	E. S. Bowen	Henry Bowman	New-York City.
Erie	P. P. Wright		New-York, N. Y.
Eastern Division	E. O. Hill		Port Jervis, N. Y.
Delaware Division	Benj. Thomas		Port Jervis, N. Y.
Rochester Division	M. E. Brown		Rochester, N. Y.
Susquehanna Div.	C. W. Gardner		Elmira, N. Y.
Buffalo Division	R. G. Taylor		Buffalo. N. Y.
Western Division	J. S. Beggs		Buffalo, N. Y.
Erie & Pittsburg		Wm. Mullins	Pittsburg, Pa.
European & North-American	M. H. Angel	M. H. Angell	Bangor, Maine.
Evansville & Crawfordsville	John E. Martin.		Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.

F

Fitchburg	Chas. L. Haywood	John Adams	Boston, Mass.
Flint & Pere Marquette	Sanford Keeler	Geo. C. Cook	East-Saginaw, Mich I
Flushing & North-Shore	I. D. Barton		Hunter's Point L.
Flushing & North-Shore		A. E. Godeffroy	New-York City.
Fort Wayne, Jackson & Saginaw	P. B. Loomis		Jackson, Mich.
Fort Wayne, Muncie & Cin	W. W. Worthington		Fort Wayne, Ind.

G

Galveston, Harrisburg & San Antonio	Hardy Eddins	J. W. Pierce	Galveston, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Georgia	S. K. Johnson	John Vaughn	Augusta, Ga.
Gilman, Clinton & Springfield	D. H. Conklin		Springfield, Ill.
Grand Rapids & Indiana.	*C. E. Gorham		Fort Wayne, Ind.
S. Division	J. M. Matheany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich.
Grand Rapids & Indiana	*W. O. Hughart	William Mullins	Pittsburg, Pa.
Grand Trunk	*J. Hickson	John Taylor	Montreal, Canada.
East Division	Henry Bailey		Montreal, Canada.
West Division	W. J. Spicer		Toronto, Canada.
Grand Tower and Carbondale	H. V. Olyphant	Wm. W. Harris	Grand Tower, Ill.
Great Southern of Ga. & Fla	M. H. Alberger		Jacksonville, Fla.
Great Western (Canada)	Andrew Watson	Robert Beatty	Hamilton, Canada.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.

H

Hannibal & St. Joseph	L. W. Towne	L. W. Towne. / W. J. Hilton. / L. W. Morse.	Hannibal. Mo.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin	D. S. Draper	Bridgeport, Ct.
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	W. H. Vaughan		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top.	J. McKillips	B. A. Knight	Huntingdon, Pa.

I

Illinois Central.	*Jas. C. Clarke	O. Ott	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois Midland.	D. Hitchcock	‡P. Campbell	Terre Haute, Ind.
Illinois & St. Louis	W. K. McComas		St. Louis, Mo.
Indianapolis, Bloomington & Western	J. E. Gimperling		Indianapolis, Ind.
Indianapolis, Bloomington & Western	Geo. B. Wright, Receiver		Indianapolis, Ind.
Indianapolis, Cincinnati & Lafayette	Geo. L. Barringer	E. V. Cherry	Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna		Indianapolis, Ind.
Indianapolis & Vincennes		Wm. Mullins	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward	J. W. Morse	St. Louis, Mo.
Indianapolis, Peru & Chicago	C. B. Robinson	D. Macy.	Indianapolis, Ind.
Michigan City Division	E. C. Murphy		La Porte, Ind.
Intercolonial Railway	Lewis Carvell	Sam. Watson	Moncton, N. B.
International & Great Northern	H. M. Hoxie		Houston, Texas.

J

Jacksonville, North-Western & S. E.	E. S. Greenleaf		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	Robert Walker		Jacksonville, Fla.
Jeffersonville, Madison & Indianapolis.		Wm. Mullins	Pittsburg, Pa.
Jefferson, Madison & Indianapolis,	Horace Scott		Louisville, Ky.
Junction & Breakwater	Wm. Groom		Lewis, Del.

K

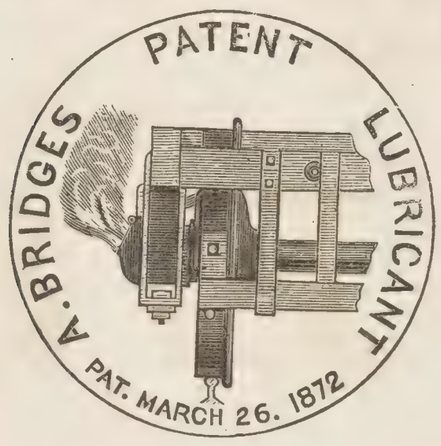
Kansas Central	W. R. Martin		Leavenworth, Kan.
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard	J. F. Barnard	St. Joseph, Mo.
Kansas Midland	W. W. Fagan.		Topeka, Kan.
Kansas Pacific	O. S. Lyford		Kansas City, Mo.
Kansas Pacific	O. S. Lyford	J. L. Woods	St. Louis, Mo.
Kaw Valley Division	O. H. Dorrance		Lawrence, Kansas.
Smoky Hill Division	A. B. Garner		Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col.
Kentucky Central	G. H. Pendleton	Geo. P. Bowler	Covington, Ky.
Keokuk & Des Moines Valley	Geo. H. Griggs	G. E Kilbourne	Keokuk, Iowa.
Knox & Lincoln	C. A. Coombs	Oliver Morse	Bath, Maine.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
L			
Lackawanna & Bloomsburg	D. T. Bound		Kingston, Pa.
Lackawanna & Bloomsburg		G.W. B. Cushing	New-York City.
Lake Erie & Louisville	I. H. Burgoon		Fremont, Ohio.
Lake Ontario Shore	George Bennett		Oswego, N. Y.
Lake Shore & Tuscarawas Valley	W. W. Card	W. L. Holden	Cleveland, Ohio.
Lake Superior & Mississippi	G. H. Smith		St. Paul, Minn.
Lake Shore & Michigan Southern	Charles Paine	A. C. Armstrong	Cleveland, Ohio.
Kalamazoo Division	William Wheaton		Kalamazoo, Mich.
Detroit Division			
Lansing Division			
Leavenworth, Lawrence & Galveston	B. S. Henning	Allan Bourne	Lawrence, Kan.
Lawrence & South-Western	R. B. Gemmell	R. B. Gemmell	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
		L. Chamberlin	Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa
Mahony Division	James I. Blakslee		Mauch Chunk, Pa.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	T. Hartman		Little Rock, Ark.
Logansport, Crawfordsville & S. W.	F. N. Finney		Terre Haute, Ind
Long Island	L. D. Morford	Oliver Charlick	Hunter's Point, L.
Louisville & Nashville & G. Southern	Albert Fink	G. C. Breed	Louisville, Ky.
Clarksville Division	Jas. Montgomery		Bowling Green, Ky.
Memphis Division	J. T. Flynn		Memphis, Tenn.
Nashville & Decatur Division	D. F. Whitcomb		Nashville, Tenn.
So. & North Ala. Division	Robert Meek		Birmingham, Ala.
Louisville, Cin. & Lexington	J. McLeod	E. C. McMichael	Louisville, Ky.
Louisville, New-Albany & Chicago	John L. Day	J. R. Parker	New-Albany, Ind.
Louisville, Paducah & Southwestern	D. F. Whitcomb	D. F. Whitcomb	Louisville, Ky.
M			
Macon & Brunswick			Macon, Ga.
Macon & Western	Capt. G. I. Foreacre		Atlanta, Ga.
Maine Central	L. L. Lincoln	G. A. Phillips	Augusta, Me.
Androscoggin Division	A. Brown		Lewiston, Me.
Manchester & Lawrence	H. E. Chamberlin		Concord, N. H.
Marietta & Cincinnati	W. W. Peabody		Cincinnati, Ohio.
Marietta, Pittsburg & Cleveland	Jas. McArthur	R. B. Hoover	Marietta, Ohio.
Marquette, Houghton & Ontonagon	*Samuel Schoch	S. Schoch	Marquette, Mich.
Maryland & Delaware	J. L. Caldwell	J. L. Caldwell	Easton, Md.
Memphis, Carthage & North-Western	E. H. Brown		Carthage, Mo.
Memphis & Little Rock	T. S. Tate, Jr.	J. D. Darden	Memphis, Tenn.
Memphis & Charleston	W. J. Ross	J. B. Galloway	Memphis, Tenn.
Michigan Central	W. B. Strong		Chicago, Ill.
Michigan Central	‡J. R. Ledyard	John Newell	Detroit, Mich.
Grand River Valley Division	C. B. Bush		Grand Rapids, Mich.
Jackson, Lansing & Saginaw Div.	C. B. Bush		Saginaw City, Mich.
Michigan Lake Shore	Chas. E. Gorham		Fort Wayne, Ind.
Michigan Lake Shore	P. S. O'Rourke		Monteith, Mich.
Midland Railway of Canada	H. G. Taylor		Port Hope, Ont.
Midland Pacific	J. N. Converse	M. A. Showers	Nebraska City, Neb.
Milwaukee, Lake Shore & Western	H. G. H. Reed		Milwaukee, Wis.
Western Division	J. S. Buck		Appleton, Wis.
Mineral Point	G. W. Cobb	G. W. Cobb	Mineral Point, Wis.
Mineral Range	J H. Macdonald		Hancock, Mich
Mississippi & Tennessee	M. Burke	M. Burke	Memphis, Tenn.
Mississippi Valley & Western	Guy Wells		Quincy, Ill.
Missouri, Iowa & Nebraska	Col. Henry Hill		Warsaw, Ill.
Missouri, Kansas & Texas	C. H. Chappel		Sedalia, Mo.
Missouri, Kansas & Texas	*R. S. Stevens	G. M. Babcock	Sedalia, Mo.
Cherokee Division	L. H. Sheldon		Parsons, Kansas.
Choctaw Division	S. G. Eddy		Dennison, Texss.
Missouri Division	J. J. Frey		Sedalia, Mo.
Sedalia Division	J. J. Frey		Sedalia, Mo.
Neosho Division	L. H. Sheldon		Parsons, Kansas.
Osage Divsion	C. M. Sheafe		Holden, Mo.
Missouri Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Missouri River, Fort Scott & Gulf	B. S. Henning	Allan Bourn	Kansas City, Mo.
Mobile & Ohio	A. L. Rives	C. E. Rushing	Mobile, Ala.
Alabama Division	Cecil Fleming		Mobile, Ala.
Mississippi Division	E. S. Hosford		Macon, Miss.
Tenn. & Ky. Divis on	G. W. Robertson		Jackson, Tenn.
Mobile & Girard	W. L. Clark		Columbus, Ga.
Mobile & Montgomery	G. Jordon	G. Jordon	Montgomery, Ala.
Montgomery & Eufaula	B. Dunham	B. Dunham	Montgomery, Ala.
Morgan's Louisiana & Texas		C. A. Whitney & Co.	New-Orleans, La.
N			
Nashville, Chattanooga & St. Louis	J. W. Thomas	L. P. Barnes	Nashville, Tenn.
Naugatuck	G. W. Beach		Bridgeport, Ct.
New-Brunswick & Canada		Tho. H. Street	St. Andrews, N. B.
New-Brunswick & Canada	John Stewart		St. Stephens, N. B.
New-Bedford & Taunton	Warren Ladd		New-Bedford, Mass.
New-Haven & Derby	E. S. Quintard		New-Haven, Ct.
New-Haven & Northampton	C. N. Yeamans	C. N. Yeamans	New-Haven, Ct.
New-Haven, Middletown & Willimantic	W. A. Waterbury	W. A. Waterbury	Middletown, Ct
New-Jersey Midland	W. E. Lewis		Wortendyke, N. J.
New-Jersey Southern	*W. S. Sneden		Long Branch, N. J.
New-Orleans & Selma	T. H. Du Puy		Selma, Ala.
New-Orleans, St. Louis & Chicago	*E. D. Frost	S. H. Edgar, V. P.	New-Orleans, La.
New-Orleans, Mobile & Texas	S. N. Scranton		New-Orleans, La.
New-York & Harlem	Chas. M. Bissell	R. C. Moore	New-York, N. Y.
New-York, New-Haven & Hartford	E. M. Reed	R. N. Dowd	New Haven, Ct.
N. Y. & N. H. Division	John T. Moody		New-York, N. Y.
Hartford Division	C. S. Davidson		Hartford, Ct.
Shore Line Division	W. H. Stephenson		New-Haven, Ct.
New-York, Boston & Montreal	C. L. Kimball		Dutchess Jn., N. Y.
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New-York Central & Hudson River		C. V. DeForest	New-York.
Eastern Division	Zenas C. Priest		Utica, N. Y.
Syracuse & Rochester Division	G. H. Burrows		Syracuse, N. Y.
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Worcester Division	P. St. M. Andrews		Worcester, Mass.
New-York & Oswego Midland			New-York, N. Y.
New-Jersey Division	G. W. N. Custis		Jersey City, N. J.
Middle Division	H. M. Flint		Middletown, N. Y.
Western Division			Oswego, N. Y.
New-York, Kingston & Syracuse	H. P. Breed		Rondout, N. Y.
New-York, Providence & Boston	A. S. Matthews	A. S. Matthews	Stonington, Ct.
New Brunswick	Tho. Hoben	W. R. Logan	Fredericton, N.B.
Northern Pacific	*C. W. Mead	E. F. Williams	St. Paul, Minn.
Minnesota Division	J. H. Sullivan		Brainerd, Minn.
Northern Pacific Division	*J. W. Sprague		Kalama, W. T.
Lake Superior & Miss. Division	George H. Smith		St. Paul, Minn.
North-Louisiana & Texas	W. R. Gordon		Monroe, La.
North-Pennsylvania	S. W. Roberts	F. A. Cornby	Philadelphia, Pa.
Northern Canada	†F. W. Cumberland		Toronto, Can.
Northern Central	A. R. Fiske	A. W. Sumner	Harrisburg, Pa.
Northern (New-Hampshire)	George E. Todd		Concord, N. H.
North-Eastern (South-Carolina)	F. K. Huger		Charleston, S. C.
O			
Ohio & Mississippi	E. L. Ryder		Cincinnati, Ohio.
Oil Creek & Alleghany River	C. J. Hepburn		Oil City, Pa.
Old Colony	J. R. Kendrick		Boston, Mass.
Omaha & North-Western	J. E. House		Omaha, Neb.
Oregon & California	J. Brandt, Jr.	G. W. Weidler	Portland, Oregon.
P			
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Paris & Danville	B. F. Matthius		Danville, Ill.
Pennsylvania	G. Clinton Gardner		Altoona, Pa.
Pennsylvania	*Frank Thomson	Enoch Lewis	Philadelphia, Pa.
Philadelphia Division	W. F. Lockard		Philadelphia, Pa.
Middle Division	J. N. McCrea		Harrisburg, Pa.
Pittsburg Division	Rob't Pitcairn		Pittsburg, Pa.
Tyrone Division	S. S. Blair		Tyrone Pa.
Bedford Division	S. M. Prevost		Bedford, Pa.
West Pennsylvania Division	J. McCreighton		Allegheny City, Pa.
Pensacola & Louisville	C. S. Williams		Pensacola, Fla.
Peoria & Rock Island	John R. Hilliard		Peoria, Ill.
Peoria & Rock Island	*W. R. Hamilton	W. R. Hamilton	Peoria, Ill.
Peoria, Pekin & Jacksonville	James F. Kelsey		Pekin, Ill.
Petersburg	R. A. Bacon	W. P. Taylor	Petersburg, Va.
Philadelphia & Reading	J. E. Wootten	W. S. Wilson	Reading, Pa.
Catawissa & Williamsport Br'ch	George Webb		Pittsburg, Pa.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Lebanon & Tremont	H. W. Tracy		Pine Grove, Pa.
Philadelphia and Baltimore Central	Henry Wood	Henry Wood	Philadelphia, Pa.
Philadelphia & Erie	W. A. Baldwin		Williamsport, Pa.
Philadelphia & Erie		Enoch Lewis	Philadelphia, Pa.
Western Division	J. W. Reynolds		Erie, Pa.
Middle Division	Edmund L. Tyler		Renovo, Pa.
Eastern Division	Thomas Gucker		Williamsport, Pa.
Philadelphia, Wilmington & Baltimore	H. F. Kenney		Philadelphia, Pa.
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Pittsburg & Cin. Division	S. M. Felton, Jr.		Pittsburg, Pa.
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Western Division	C. D. Gorham		Fort Wayne, Ind.
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Portsmouth	H. E. Chamberlin		Concord, N. H.
Poughkeepsie & Eastern	J. A. Perkins	A. W. Cable	Poughkeepsie, N.Y
Providence & Worcester	W. D. Hilton	W. D. Hilton	Providence, R. I.
Providence, Warren & B	Waterman Stone		Providence, R. I.
Q			
Quincy, Alton & St. Louis	N. J. T. Dana	N. J. T. Dana	Quincy, Ill.
Quincy, Missouri & Pacific	J. R. Buchanan		Quincy, Ill.
R			
Raleigh & Gaston	A. B. Andrews	A. B. Andrews	Raleigh, N. C.
Rensselaer & Saratoga	H. A. Fonda		Albany, N. Y.
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Richmond & Danville	T. M. R. Talcott		Richmond, Va.
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Richmond & Petersburg	Augustus Shaw		Richmond, Va.
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Northern Division	Henry Looseley		Rock Island, Ill.
Southern Division	Geo. L. Walker		Beardstown, Ill.
Rome, Watertown & Ogdensburg	J. W. Moak		Watertown, N. Y.
S			
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St. Paul & Pacific	E. Q. Sewell	E. C. Becker	St. Paul, Minn.
St. Paul & Sioux City	J. F. Lineoln	J. F. Lincoln	St. Paul, Minn.
St. Louis, Alton & Terre Haute	W. G. Broughton		St Louis, Mo.
St. Louis, Iron Mountain & Southern	Arthur W. Soper	W. S. Cuddy	St. Louis, Mo.
St. Louis, Iron Mountain & Southern	*Tho. McKissock		St. Louis, Mo.
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St Louis Division	W. H. Vaughan		St. Louis, Mo.
Western Division	C. L. Dunham		Kansas City, Mo.
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San Francisco & Northern Pacific	A. A. Bean	F. H. Gudes	Petaluma, Cal.
San Rafael & San Quentin	David Nye		San Rafael, Cal.
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Seaboard & Roanoke		E. G. Ghio	Baltimore, Md.
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Southern Minnesota	W. C. Van Horne		Wells, Minn.
Southern Pacific of California	A. N. Towne		Sacramento, Cal.
Southwestern of Georgia	Virgil Powers		Macon, Ga.
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Stonington & Providence	A. S. Mathews	A. S. Mathews	Stonington, Ct.
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Texas & Pacific	Geo. H. Noble	Wm. Mahl	Marshall, Texas
Tioga	L. H. Shattuck		Blossburg, Pa.
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Toledo, Peoria & Warsaw		Oran Ott	Chicago, Ill.
Western Division	David K. Smith		Peoria, Ill.
Western Division	William E. Dorwin		Warsaw, Ill.
Toledo, Wabash & Western		J. T. Sterling	Toledo, Ohio.
Eastern Division	C. W. Bradley		Toledo, Ohio.
Western Division	Robt. Andrews		Springfield, Ill.
Toledo, Canada Southern & Detroit	D. Edwards		Toledo, Ohio.
Troy & Boston	C. W. Moseley		Troy, N. Y.
Toronto, Grey & Bruce	N. Weatherston	W. Watson	Toronto, Can.
Toronto & Nipissing	J. C. Bailey		Toronto.
Tuckerton	J. Naramore		Tuckerton, N. J.
U			
Union Pacific	S. H. H. Clarke	S. H. H. Clarke	Omaha, Neb.
Mountain Division	S. J. Nichols		Cheyenne, Wyom'g.
Laramie Division	S. T. Shankland		Laramie, Wyoming.
Western Division	O. H. Earll		Evanston, Wyoming.
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Utica & Black River	J. F. Maynard		Utica, N. Y.
Utica, Ithaca, & Elmira	H. P. Goodrich		Ithaca, N. Y.
V			
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Vermont Central	J. W. Hobart		St. Albans, Vt.
Western Division	John Schrier		Ogdensburg, N. Y.
Central & Southern Division	Ambrose Arnold		St. Albans, Vt.
Northern & Eastern Division	G. L. Stone		" " "

Railroad.	Superintendent.	Purchasing Agent.	Residence.
Rutland Division	J. Burdett		Rutland, Vt.
Harlem Extension Division	J. Burdett		Rutland, Vt.
New-London Northern	G. W. Bentley		New-London, Ct.
Vicksburg & Meridian	E. F. Raworth		Vicksburg, Miss.
Virginia & Truckee	C. M. Yerrington		Carson, Nevada.
Washington & Ohio	R. H. Havener	Lewis McKenzie	Alexandria, Va.
Welland	William Pay		St. Catherine, Ont.
Westchester & Philadelphia	Henry K. Smith	J. J. Bryant	Philadelphia, Pa.
West-Wisconsin	W. G. Swan		Hudson, Wis.
West-Jersey	W. J. Sewell		Camden, N. J.
Western of North-Carolina	John M. Rose		Fayetteville, N. C.
Western & Atlantic	Wm. McRae		Atlanta, Ga.
Western Maryland	*J. M. Hood		Baltimore, Md.
Western Union	D. A. Olin		Racine, Wis.
White Water Valley	H. M. Britton	H. M. Britton	Cincinnati, Ohio.
Wilmington & Western	David Connell		Wilmington, Del.
Wilmington, Columbia & Augusta	James Anderson	James Anderson	Wilmington, N. C.
Wilmington & Weldon	J. F. Devine		Atlanta, Ga.
Wilmington & Reading	E. Collings	C. Stoltz	Coatesville, Pa.
Winona & St. Peter	S. Sanborn		Madison, Wis.
Winona & St. Peter		R. W. Hamer	Chicago, Ill.
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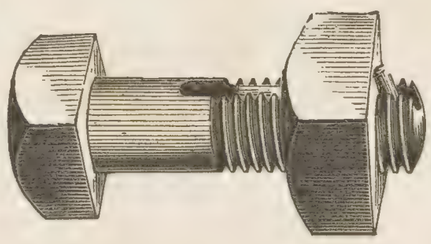
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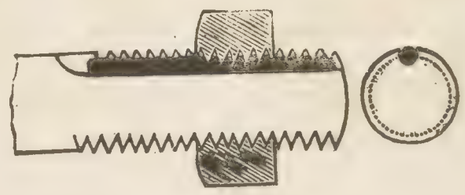
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June 16, 1868,
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SECTIONS.

Unequaled for CHEAPNESS, SIMPLICITY & EFFECTIVENESS.

This simple device, as will be seen by the engravings, consists of a groove being cut in the threaded part of a screw bolt into which is placed a key of copper wire, or other soft metal; when the nut is screwed on, it cuts a thread on the key, thereby making it impossible for the key to get out until the nut is taken off. When the nut is screwed up to its place, that part of the key over which the nut has passed is riveted up against the nut with a small punch, destroying the thread on the key. The nut, therefore, can not move backward until force is used, as with a wrench.

The groove can be rapidly cut with a simple machine designed for the purpose.

Experience has proved this device absolutely reliable, and it is the cheapest of all known devices for the purpose. By its use, old bolts on which the nuts have become too slack for use can be made as good as new, making it a great saving to railroad companies and others in that item alone. It is cheaper than a check-nut.

If the bolt should become slack from shrinking of timber or other causes, *the nut will always remain firmly attached to the bolt*, and, with the wrench, can be screwed up *any distance*, and the wire riveted up any number of times, or can be taken off without injury to the nut or bolt.

This is the only method in use that locks the nut firmly to the bolt without regard to place or surroundings, all others require some attachment that holds the bolt in its position, and a washer or other attachment to keep the nut from turning.

DIRECTIONS FOR USE.—Place the copper key in the slot, pointed end out, and beveled side up, in such a position that when the nut is screwed to its place about three-eighths of an inch of the key will project beyond its outer face. Then screw the nut to its place *over the key*, allowing it to cut its own thread in the copper. Then take a narrow flat set punch, and rivet the projecting part of the key *solidly* against the outer face of the nut. To tighten the nut: screw it up, and rivet the key tighter. To remove the nut: simply apply the wrench and unscrew the nut. It will cut its own way out through the copper. The same key can be used several times, by moving it outward a few threads in the slot.

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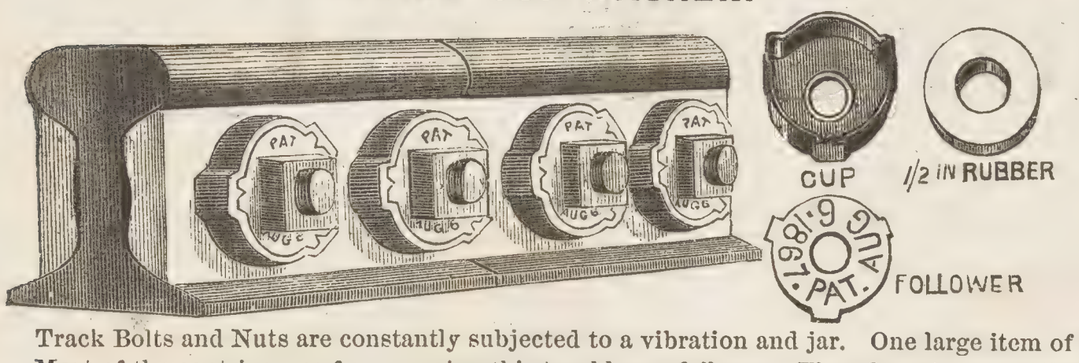
720 North Second Street, St. Louis.

32 Warren St.,

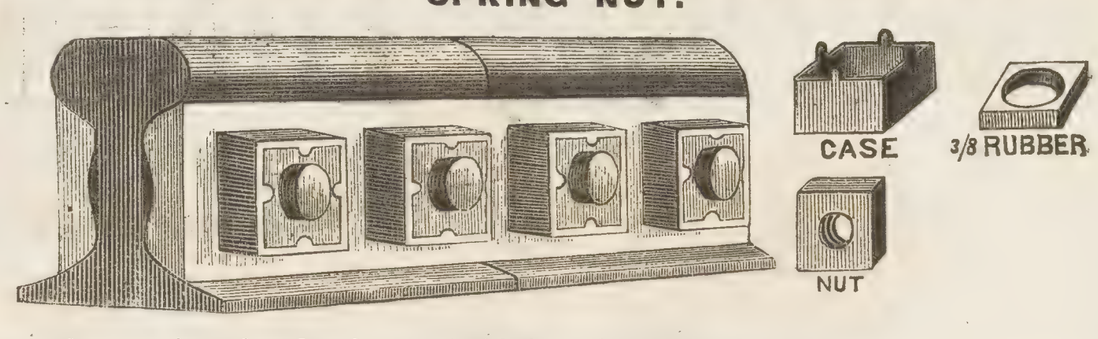
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Most of the contrivances for removing this trouble are failures. They do not remove the cause of the trouble. This can only be done by some elastic material, which will absorb the vibration and prevent its reaching the nuts. Experience proves that permanent elasticity can not be obtained by using wood, which is perishable, or steel, which can not be made of uniform temper. In our inventions, the elastic packing of rubber between the nut and the plate absorbs the jar or vibration, insulates the nut, and by removing the cause of the trouble removes the trouble itself. Among its advantages are these:

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2d. The rubber absorbs the blow given by the wheels at the joint, in such manner as to prevent fracture of rails at the joint, and accidents resulting therefrom.
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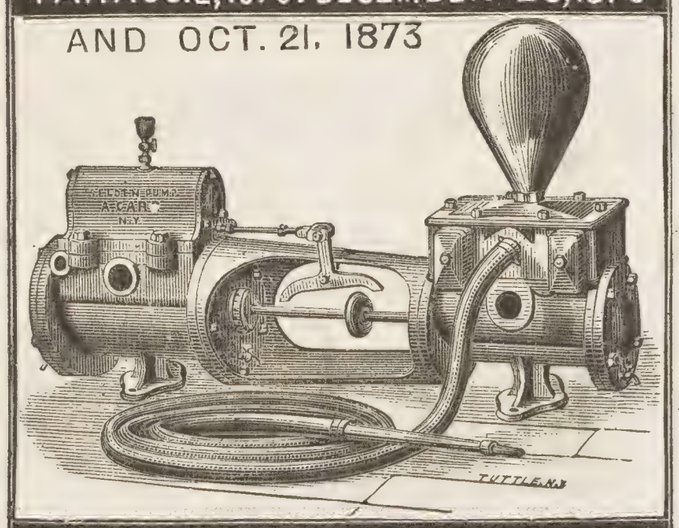
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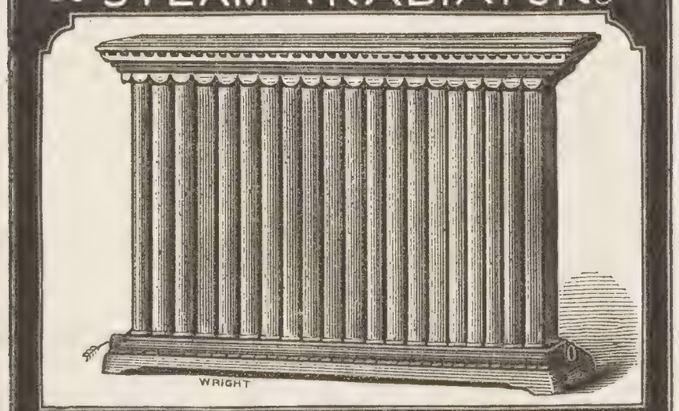
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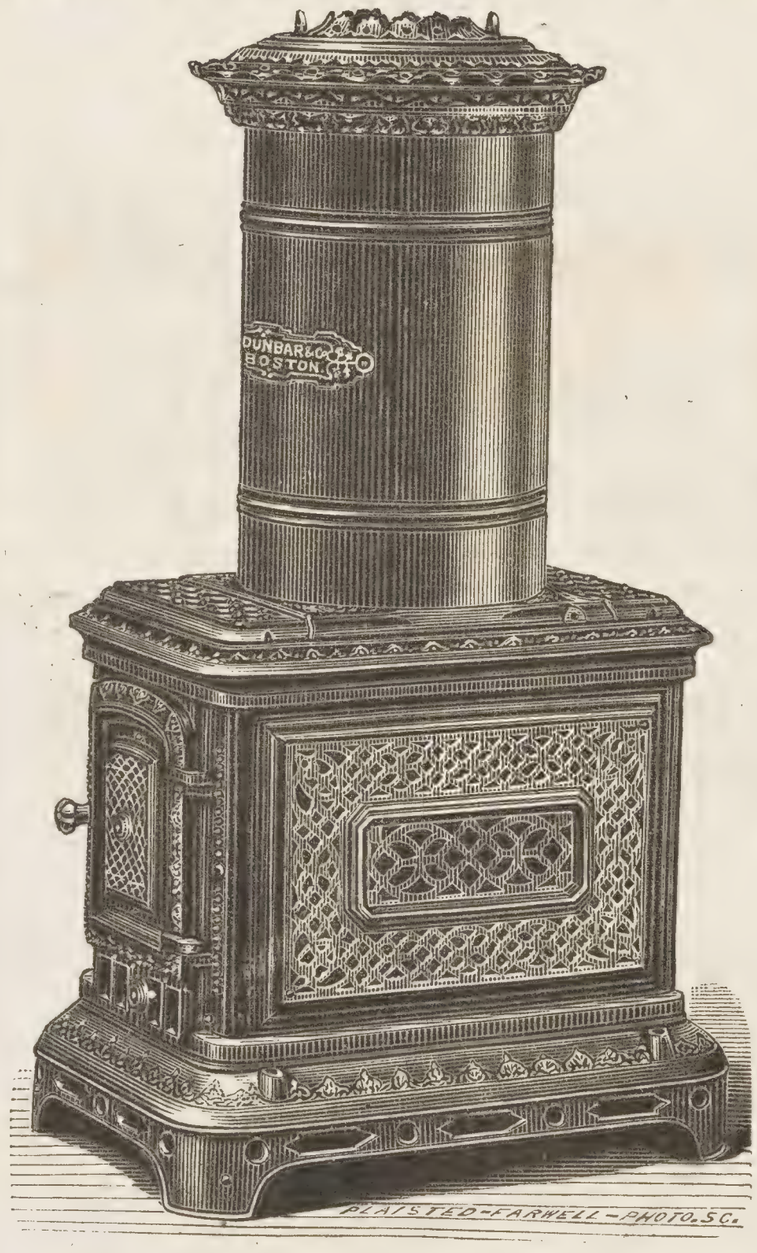
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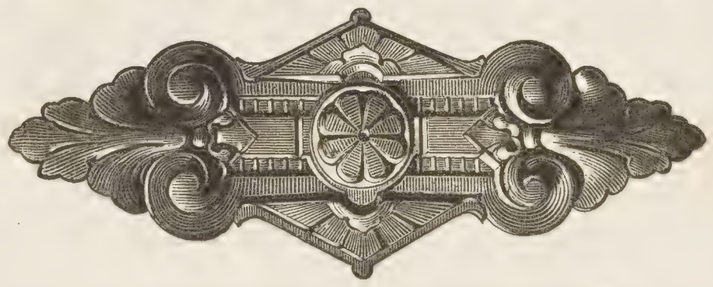
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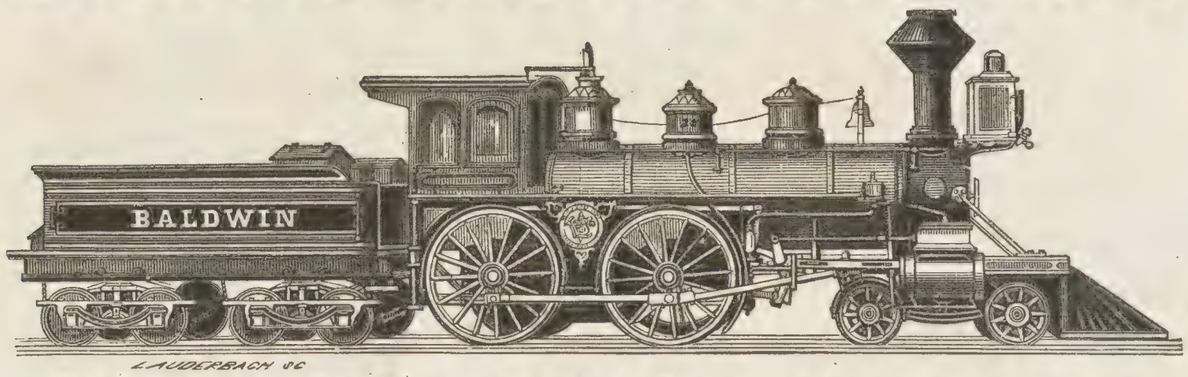
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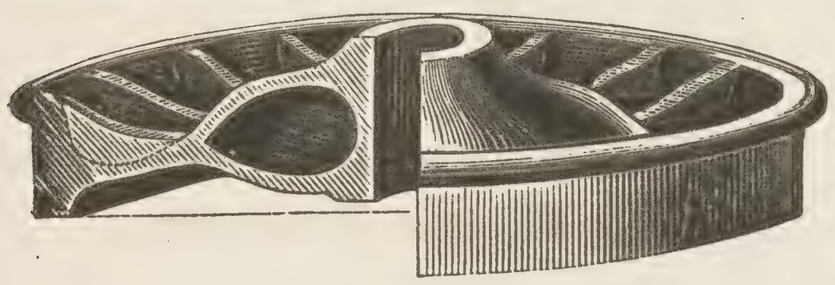
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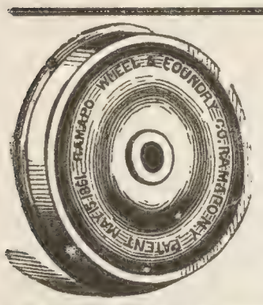
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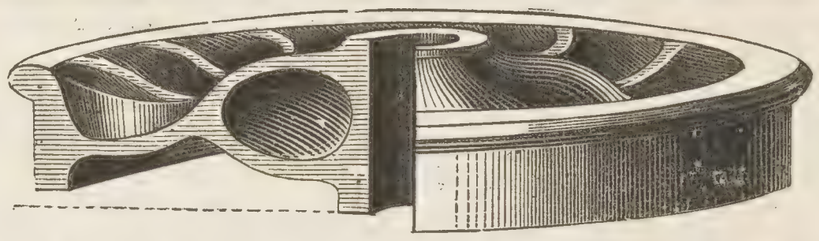
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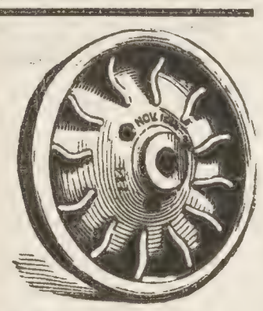
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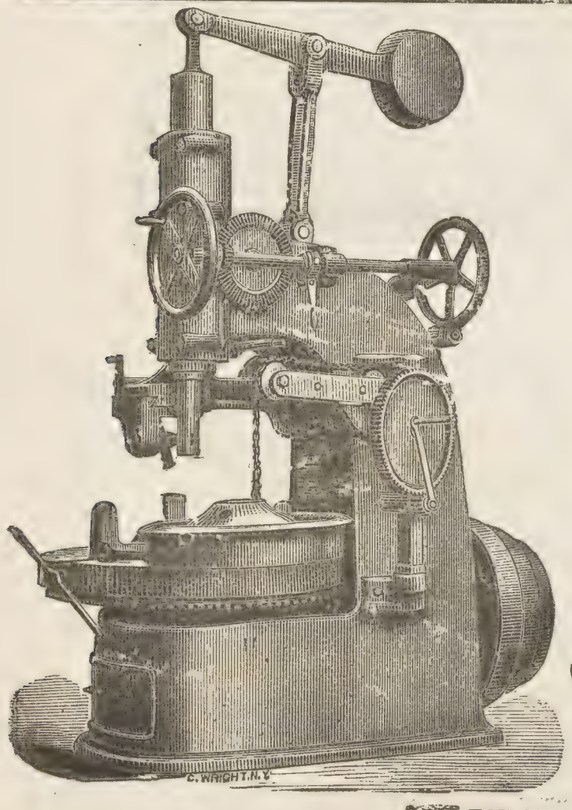
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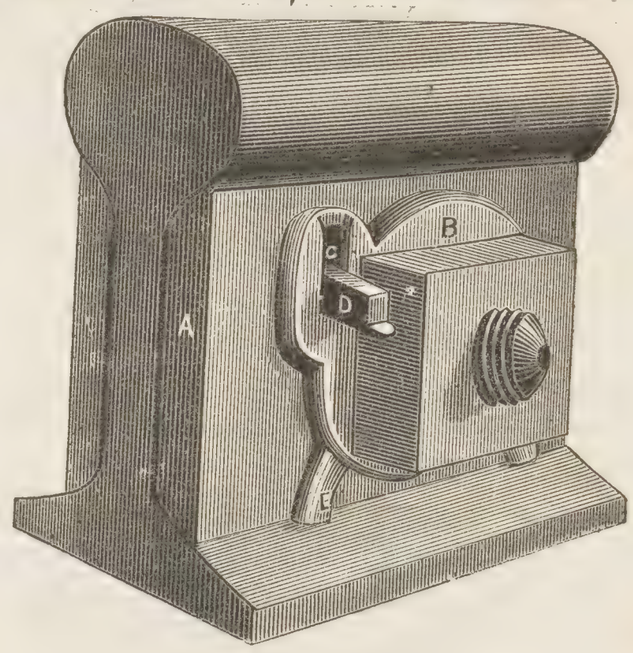
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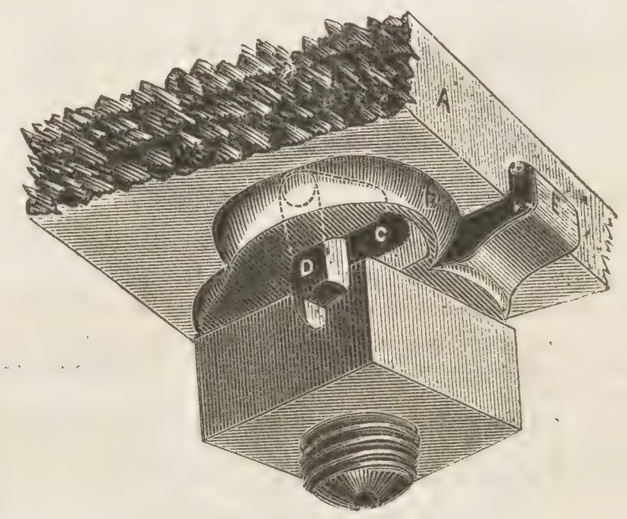
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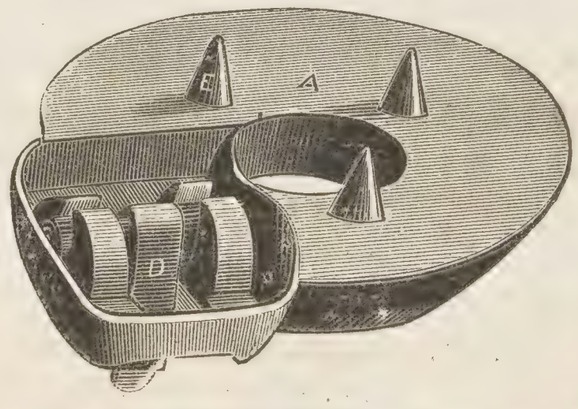
A, Fish plate. *B*, Washer, with projecting feet. *C*, Cavity into which the dog, *D*, swings, on screwing up the nut. *D*, Pivoted dog which falls by side of nut when screwed home.



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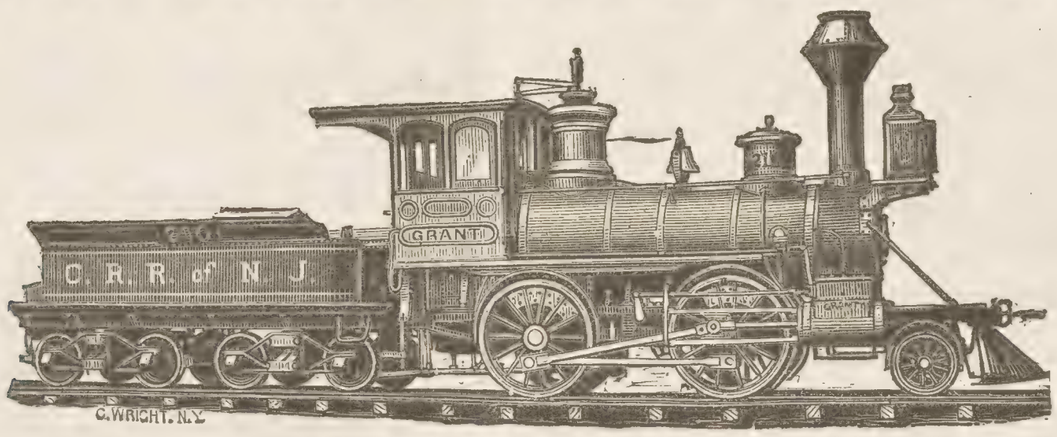
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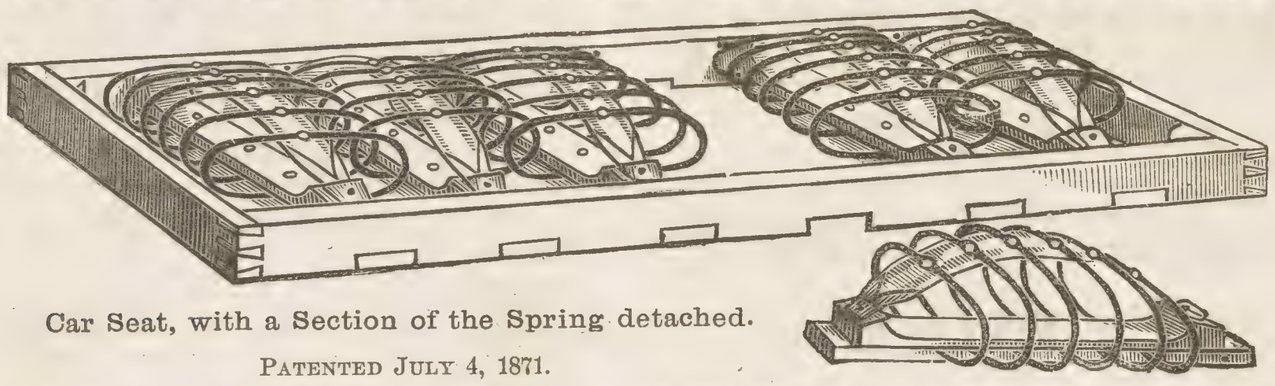
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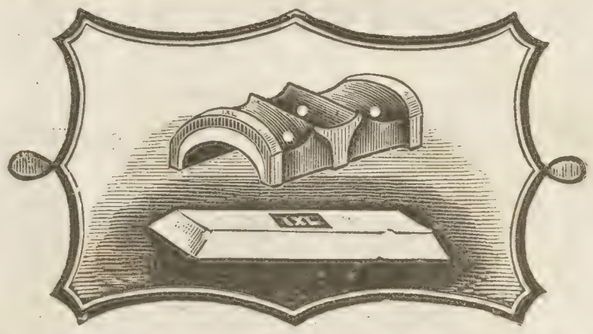
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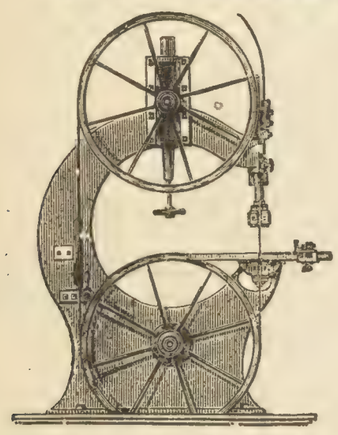
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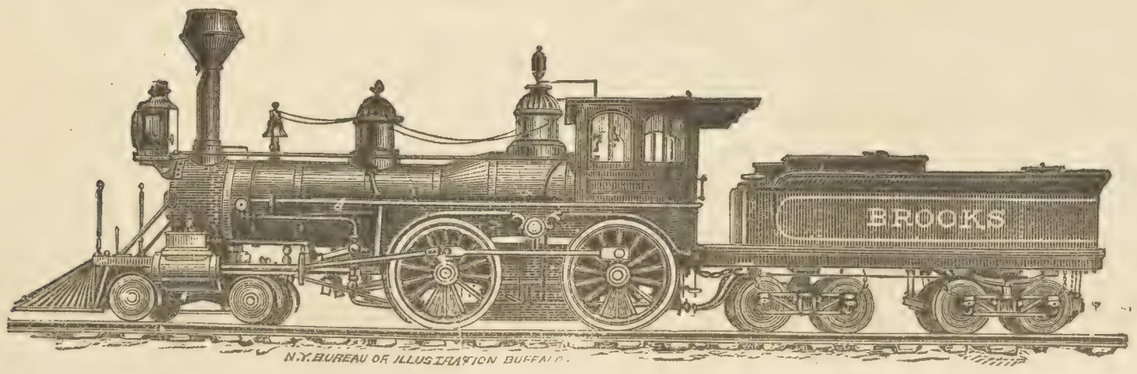
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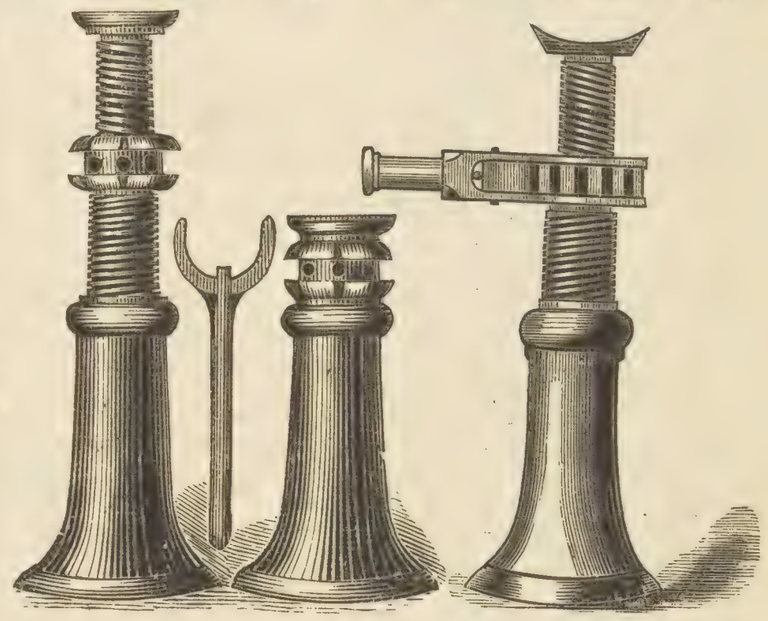
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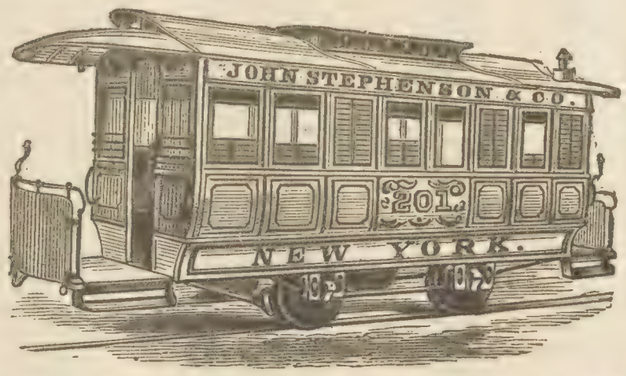
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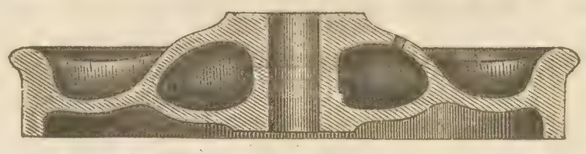
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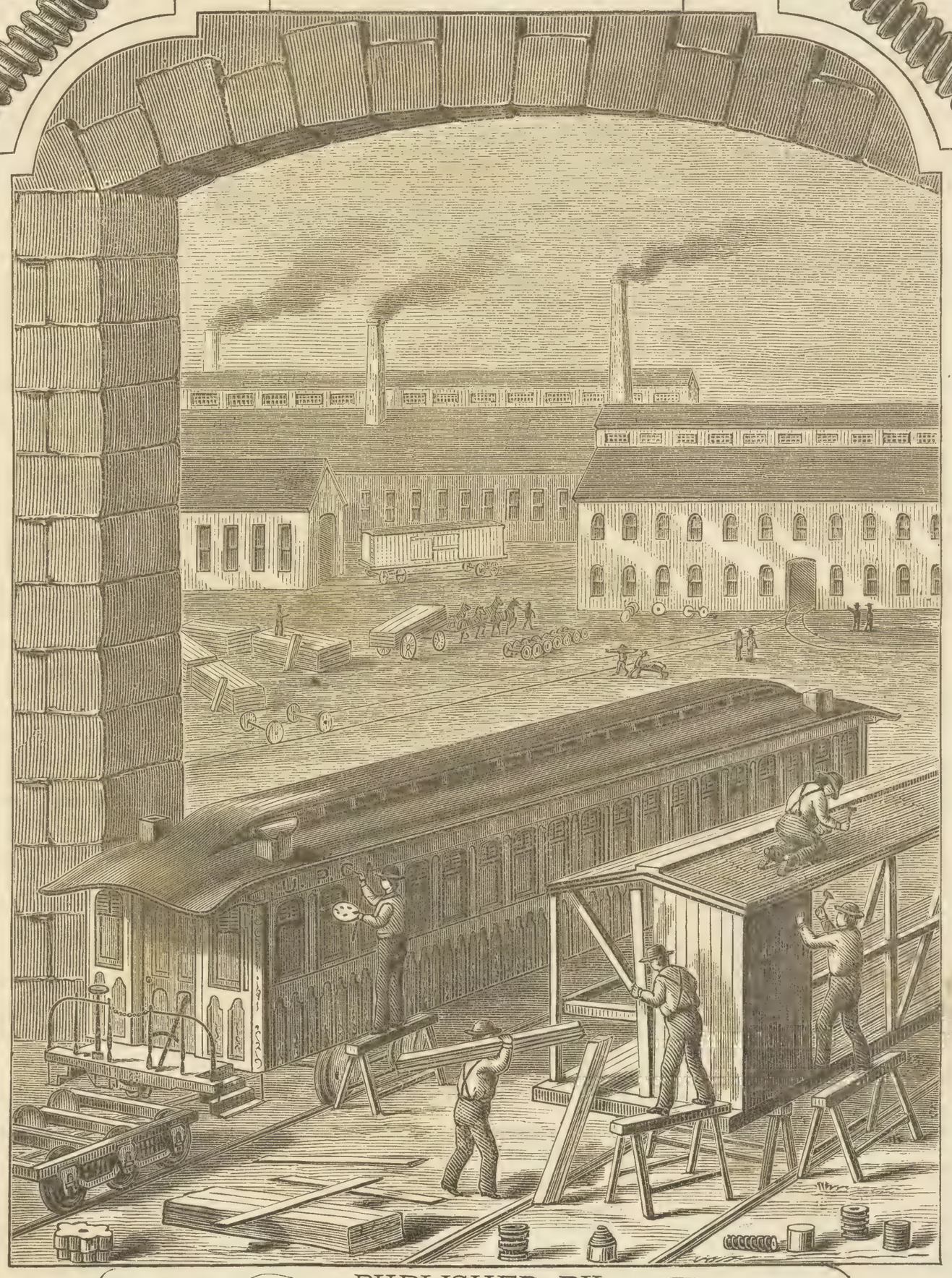
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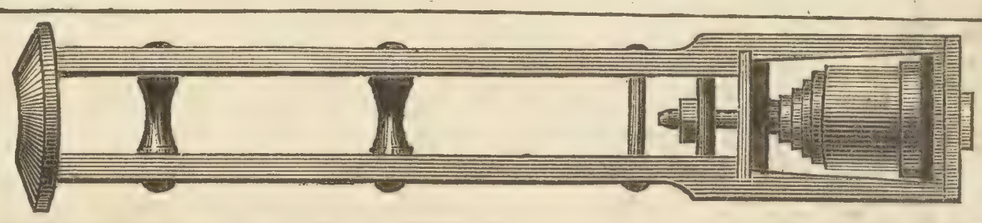
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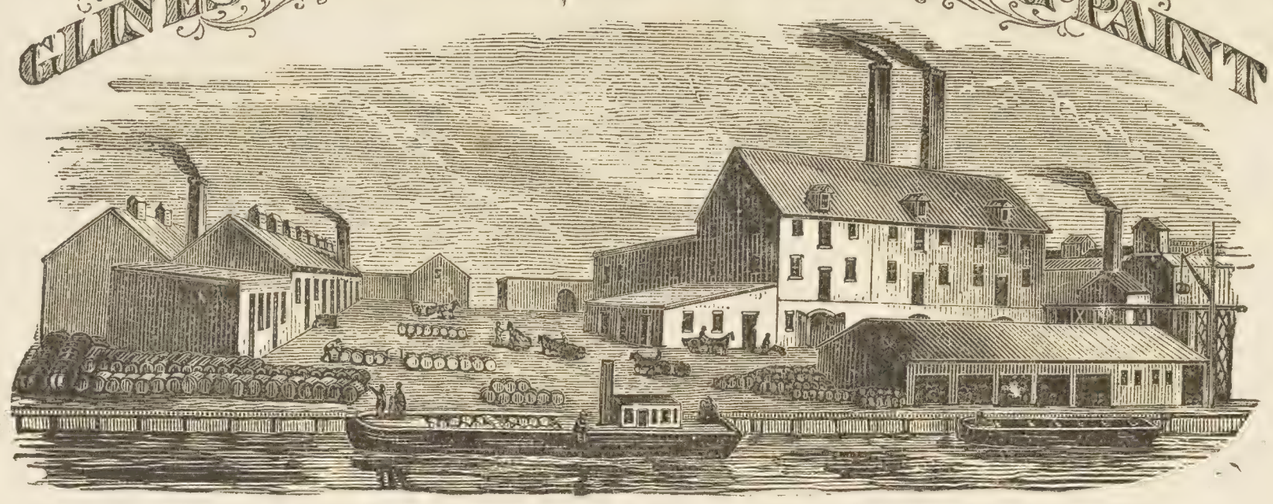
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GLINES' PATENT SLATE ROOFING PAINT



Contains no Tar.

Saves Re-shingling.

Preserves Tin or Iron.

STOPS ALL LEAKS.

AGENT WANTED IN EVERY TOWN.

☞ SEND FOR TESTIMONIALS.

A roof may be covered with a very cheap shingle, and by application of this slate be made to last from twenty to twenty-five years. ***Old Roofs*** can be patched and coated, looking much better, and lasting longer than new shingles without the slate, for ***one third the cost of reshingling.*** This Paint is *practically* fire-proof against sparks or flying embers, and for tin and iron has no equal, as it expands by heat, contracts by cold, and will not corrode in the most exposed places. Roofs covered with Tar Felt can be made water-tight at a small expense. The Slate Paint is ***EXTREMELY CHEAP!***

Two gallons cover 100 square feet of shingle roof, or 600 of tin or iron, is easily applied with a brush, and ***neither cracks in winter nor runs in summer.*** On ***decayed*** shingles it fills up the holes and pores, and gives a new, substantial roof, that lasts for years. *Curled* or *warped* shingles it brings to their places and keeps them there. It fills up all holes in felt roofs and stops the leaks. As nearly all Paints that are black contain *tar*, be sure you obtain our *genuine* article, which (for shingle roofs) is ***chocolate color,*** when first applied, changing to a uniform slate color, and is to all intents and purposes *Slate.* On ***Tin Roofs*** our *red color* is usually preferred, one coat being equal to five of any ordinary paint. For BRICK WALLS our *bright* red is the only reliable Slate Paint ever introduced that will effectually *prevent* dampness from penetrating and discoloring the plaster. Our

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is on many of the finest residences in the country, is equally adapted for inside or outside work, fences, barns, etc., readily applied by any one, has been practically tested for ***twenty*** years, and we guarantee satisfaction in both quality and *price. Send for sample card of colors.*

We examine buildings, give estimates, and *make roofs water-tight, or charge nothing.*

The public are cautioned against worthless imitations of our Paints, and those who copy our advertisements.

Orders solicited. Correspondence invited. Send for Book Circular, which contains *hundreds* of references from every State.

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WHOLESALE DEALERS IN FINE PAINTS AND GENERAL ROOFING MATERIALS,

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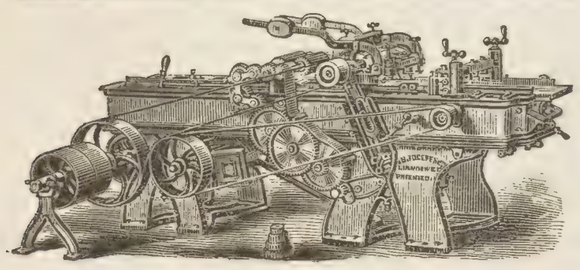
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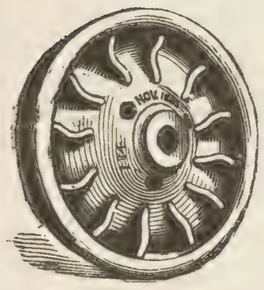
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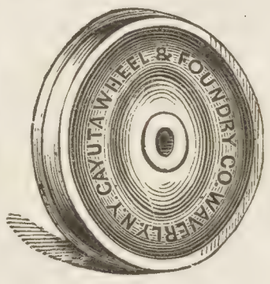
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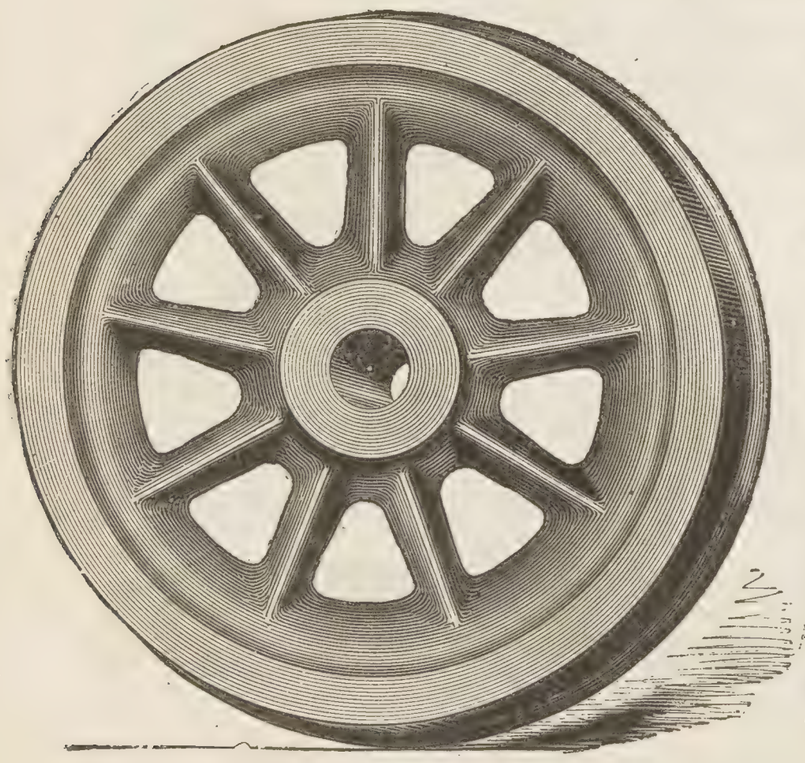
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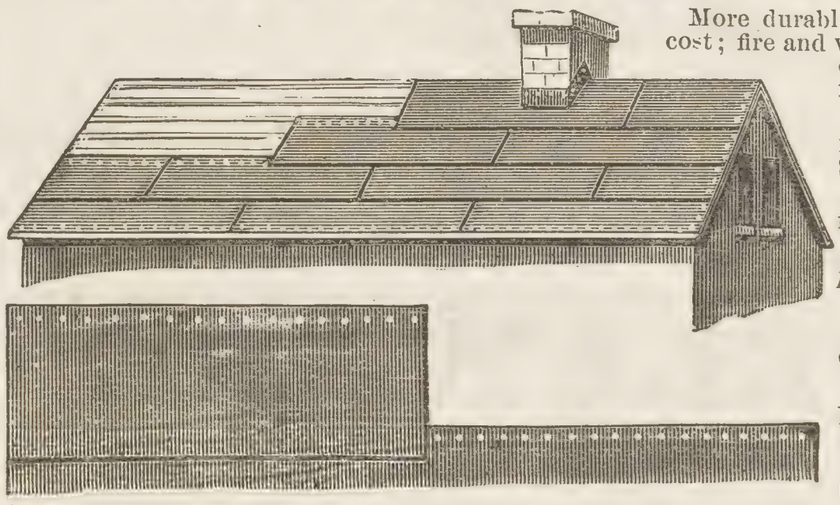
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EGYPTIAN ROOFING.



More durable than tin; one-half the cost; fire and water-proof; will not run or crack; for steep or flat roofs.

Unequaled for Covering Railroad Cars and Steamboat Decks.

Can be laid by inexperienced persons.

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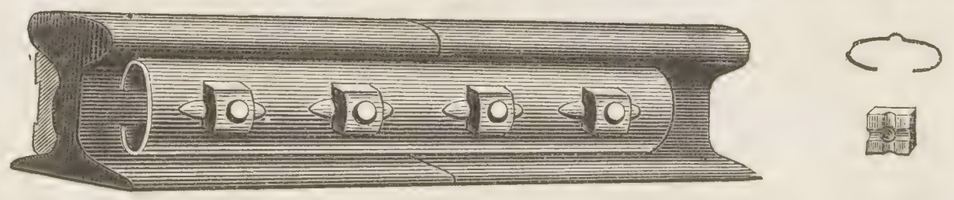
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Steam Hammers, Drops, &c. Engine Lathes, Axle Lathes, Cut-off and Centering Lathes, Patent Screw-Cutting Lathes, Planing and Slotting Machines, Wheel Borers and Wheel Pressers, Upright Drills, with Patent Universal Tables, Radial Drills.

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A Combined Nut-Lock and Fish-Plate. The Nuts are securely held in place by a Steel Plate or Rib, and protected from jar and vibration. Costs no more than ordinary wrought-iron plates.

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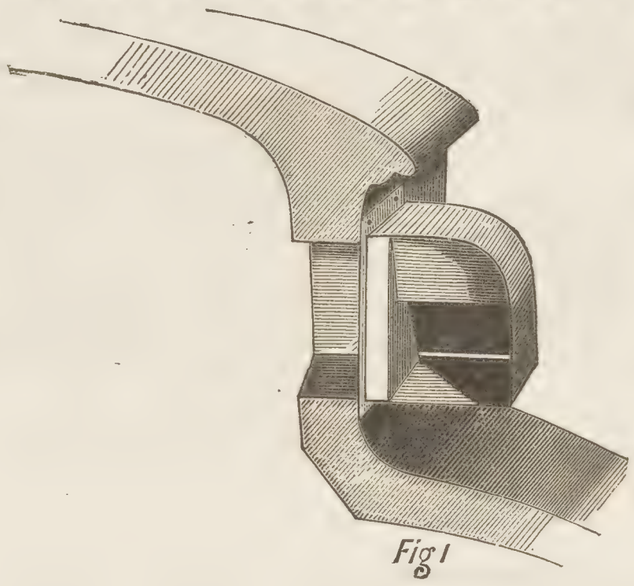


Fig 1

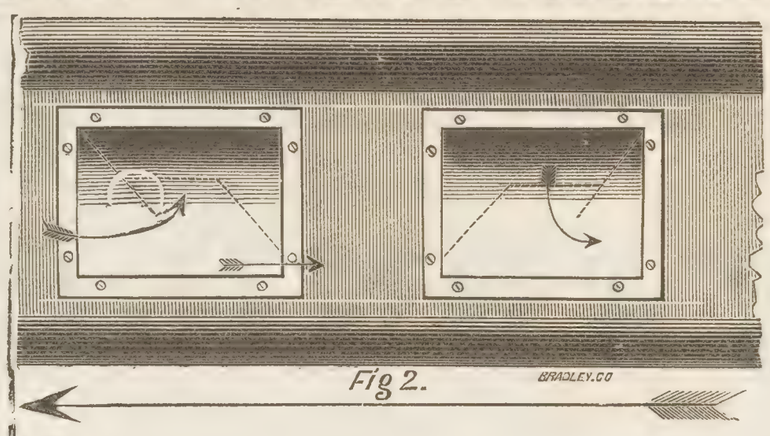


Fig 2.

THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place, it is always in readiness, and runs itself independent of all employees.

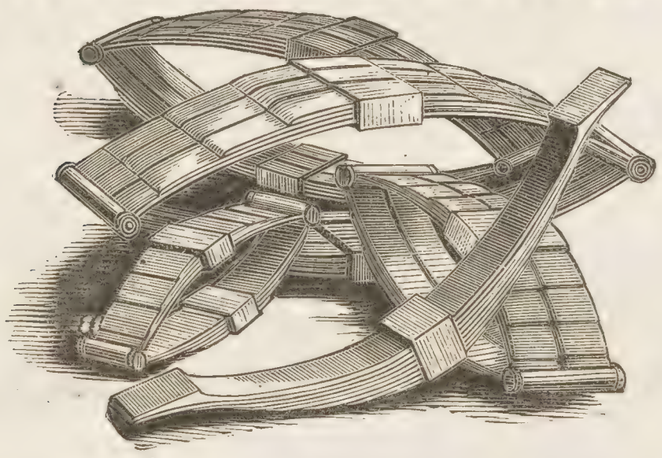
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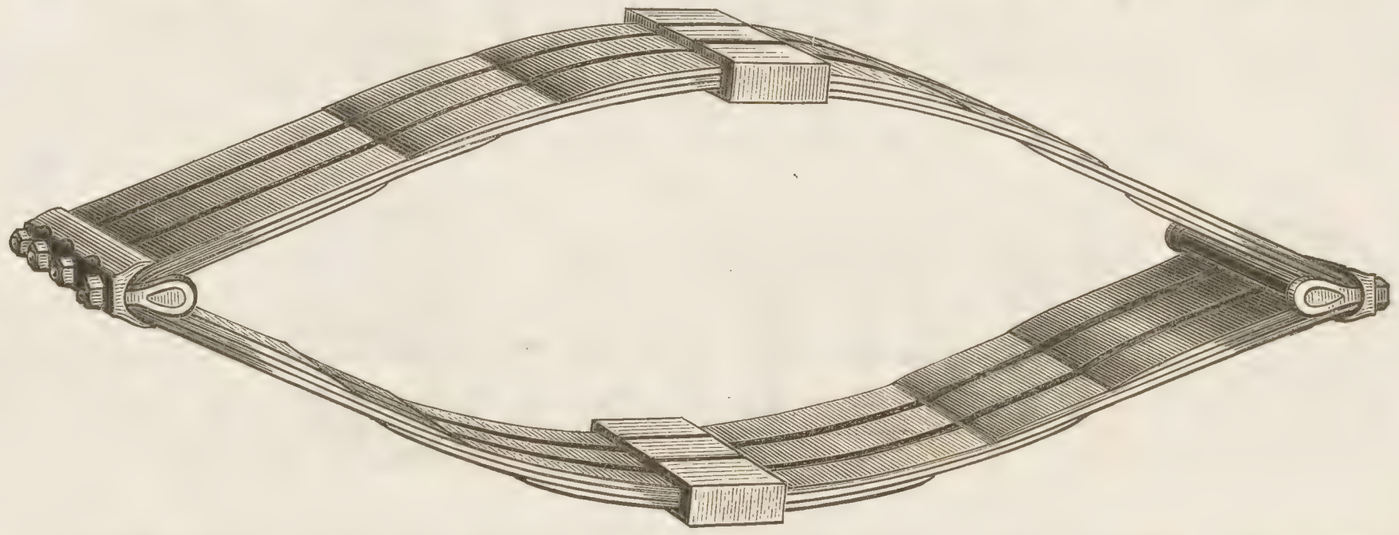
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For Freight or Passenger Service.



A continous leaf or bed-plate upon which all the short leaves work, securing a uniform pressure. Equally durable with ordinary elliptics, and saves thirty per cent of dead weight. In successful operation on a number of roads. Made of best cast steel. CHEAPER, LIGHTER, MORE ELASTIC.

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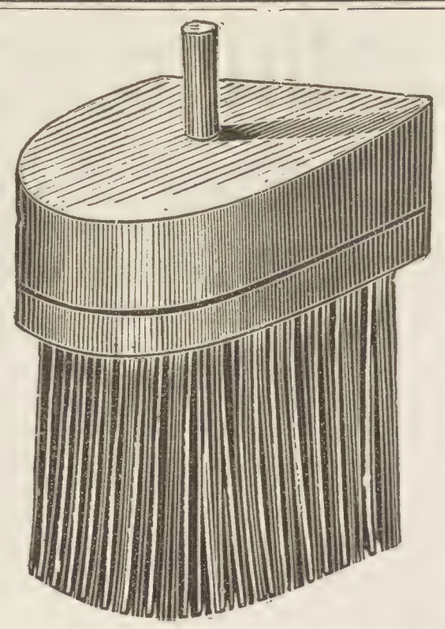
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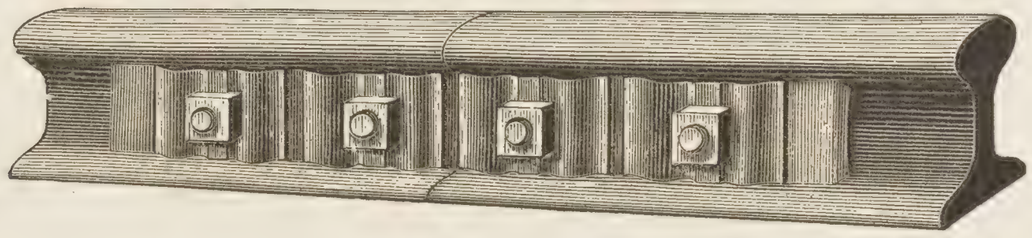
This is one of the best and most complete ***Bolt-Cutting Machines*** in the market. It will cut all sizes, from ¼ upward to 3 inches, and has no equal in practical efficiency and economy of running, as well as ready adaptation to all kinds of work occurring in a Machine Shop. Two sizes are made, Nos. 1 and 2 *Send for Circular.*

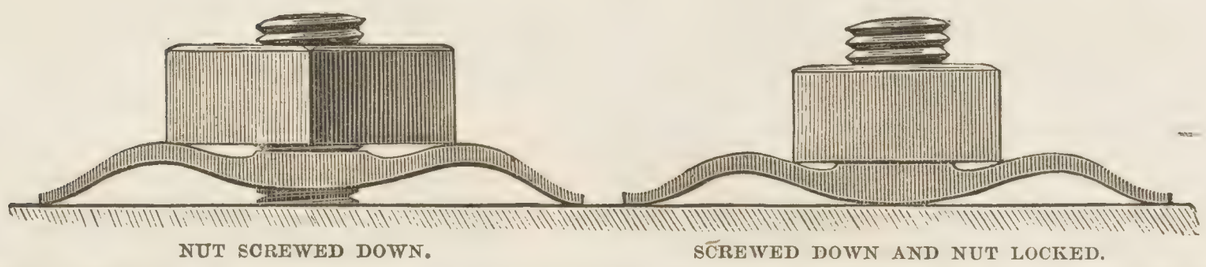
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For description, see page 35. *Sole Manufacturer.*

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FOR RAILROAD FISH JOINTS.





NUT SCREWED DOWN. SCREWED DOWN AND NUT LOCKED.

These are OIL-TEMPERED CAST-STEEL SPRINGS, so formed as to be AUTOMATIC, locking the nuts firmly, and COMPENSATING FOR EXPANSION AND CONTRACTION AND THE STRAIN AND CONCUSSION OF MOVING TRAINS, maintaining at all times the tension on the bolts and holding the plates tight to the rails. THEY ARE APPLICABLE TO ALL SPLICE JOINTS NOW IN USE WITHOUT CHANGE OF PLATES OR BOLTS, and can be applied or removed as often as may be desired without injury to them or the bolts or nuts. They have been tested by a number of heavily-operated Railroads, and pronounced superior to all other fastenings heretofore submitted to them. They are put up in boxes, each containing 500 washers, weighing about 150 pounds. Orders, stating width of plates and the thickness of bolts, respectfully solicited and promptly filled.

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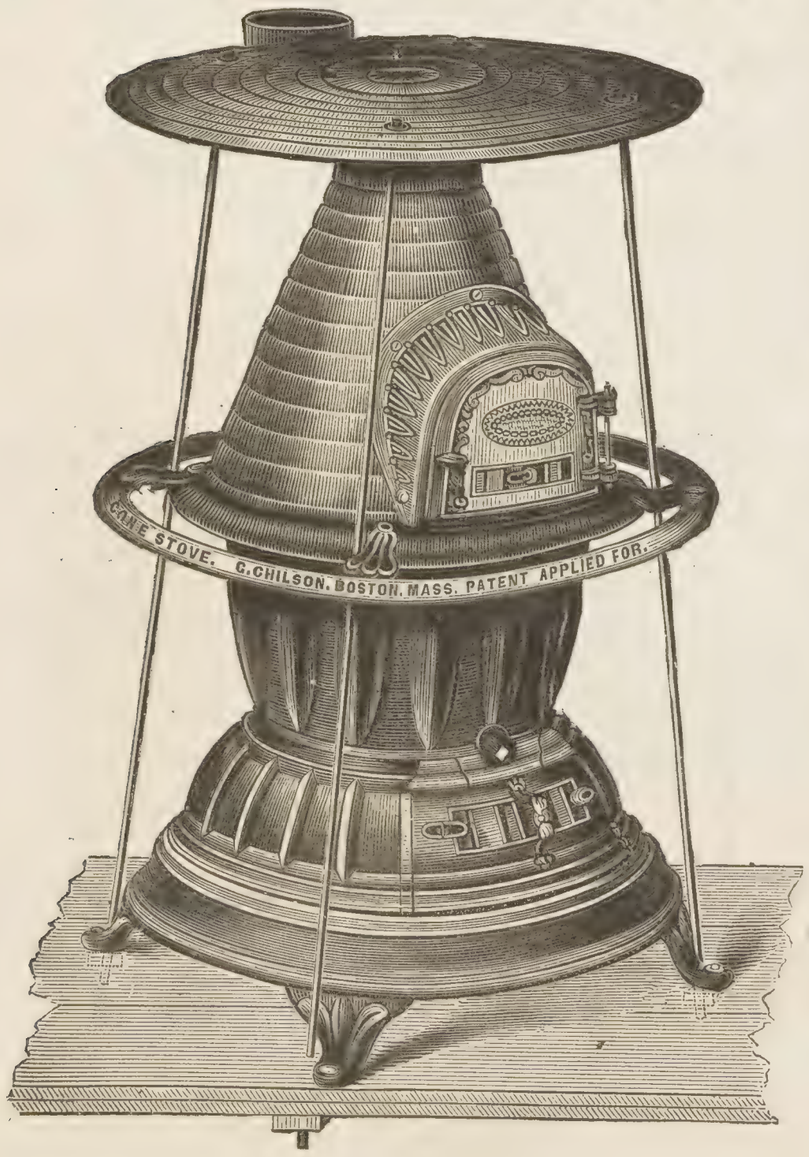
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1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.

2. The broad radiating disk prevents the heat from ascending to the upper part of the car or room, but distributes and throws it down to the floor, thoroughly warming the lower currents of cold air in the car or room for a great distance around the Stove, thus securing the long desired object of making the *lower part of the car and floor comfortably warm, especially for the feet.*

3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stoves.

4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.

5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*

6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories, Stores, Offices*, RAILROAD CARS, and STATION HOUSES, *School Rooms, Workshops, etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

The BOSTON AND PROVIDENCE RAILROAD COMPANY have over two hundred of these Stoves in use, and the BOSTON AND ALBANY and several other Roads are adopting them, with the most perfect success.

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GARDNER CHILSON, Esq.: *Dear Sir:* We have about two hundred of your new "Cone" Disk Stoves in use, (a part of them for nearly five years,) for warming Passenger Cars and Stations. I can truly say that they have given entire satisfaction. These Stoves possess many important advantages over any other we have ever used, viz.: for warming the floor and displacing the cold air in the lower part of the car, whereby they are rendered much more comfortable, especially for the feet, than by any other plan known to us. The Stove is more economical in the consumption of fuel, more substantial in construction, and consequently requiring less repairs than any other in use, and so securely constructed as to prevent fire from getting out of the stove even should the car be *overturned.* I cheerfully give my testimony in favor of this Stove, and commend it to all Railroad Managers. Yours, etc., A. A. FOLSOM, *Superintendent.*

Numerous other testimonials received from Railroads and other persons having these Stoves in use in Halls, Stores, etc., may be seen at office. Bolts are not required except for Cars and Steamboats.

Chilson's Improved Celebrated Cone Furnaces, for setting in Brickwork or in Portable Casings, Chilson's Unrivaled Double-Oven Brick Cooking-Range; Chilson's New and Splendid Arlington Portable Range; Chilson's very Superior Arlington Cooking Stove; Parlor, Office, and Store Stoves, Parlor Grates, Registers, Ventilators, etc.

Special attention given to putting up Furnaces and Ranges, and the ventilation of buildings in any part of the country.
☞ Nothing but strictly first-class work is manufactured by me. ☜

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Warranted Fire and Water Proof.

Will cover more surface and outwear any paint manufactured.

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This paint is not affected by water or extremes of cold and heat, and is peculiarly adapted for tin roofs. It will also stand hard usage, and for railroad cars or wagons can not be excelled. It has been used by the Union Pacific Railroad Company, and by whom it is pronounced superior to any quality they have ever used.

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EITHER OF IRON OR WOOD.

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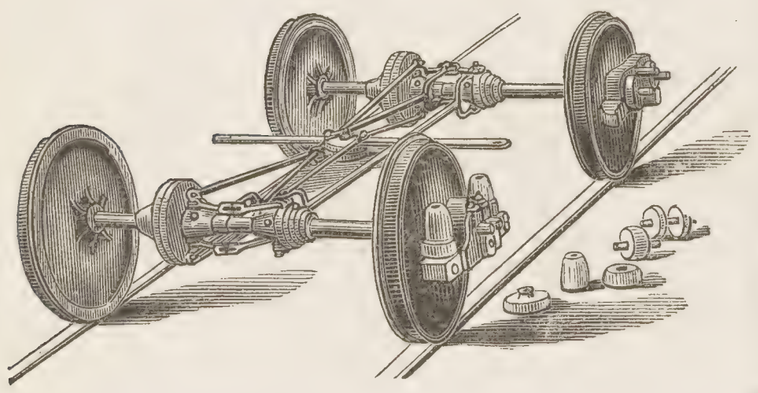
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Gen'l Purchasing Agent L. S. & M. S. R. R.

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COTTON DUCK,

For Car Covering and Car Seats,

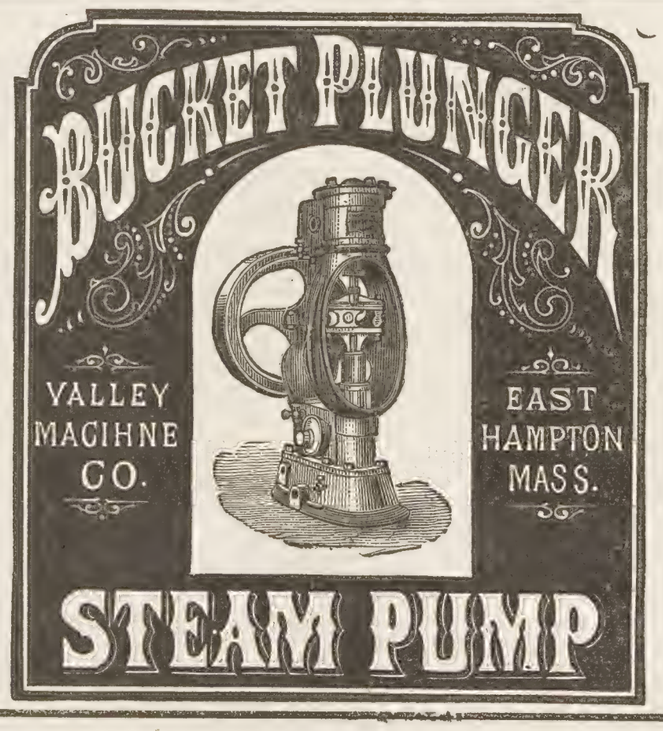
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For Cleaning and Polishing Gold, Silver, Nickel, Brass, Copper, and Lacquer Gilt on Metals. A chemical liquid free from acids, which will remove all tarnish, dirt, and grease, from whatever cause, almost instantaneously, and without injury to the metal.

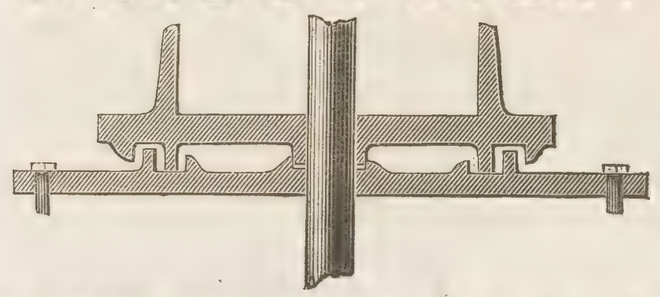
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WARD'S PATENT



CENTER OR TRANSOM PLATE

FOR RAILWAY CARS,

With Oil Receptacle for Bearing-Ring to work in. They are acknowledged to be the best in use. See description and drawings in CAR-BUILDER for January, 1874.

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This Company is now prepared to furnish on short notice, and at low prices, all kinds of

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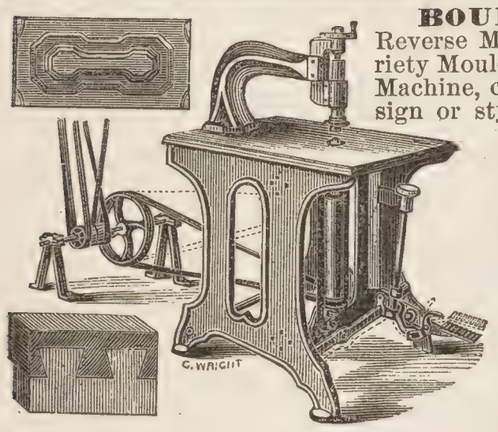
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Reverse Motion, Paneling, Variety Moulding and Dovetailing Machine, cuts Panels of any design or style of Mould in the solid wood, with neatness and dispatch.

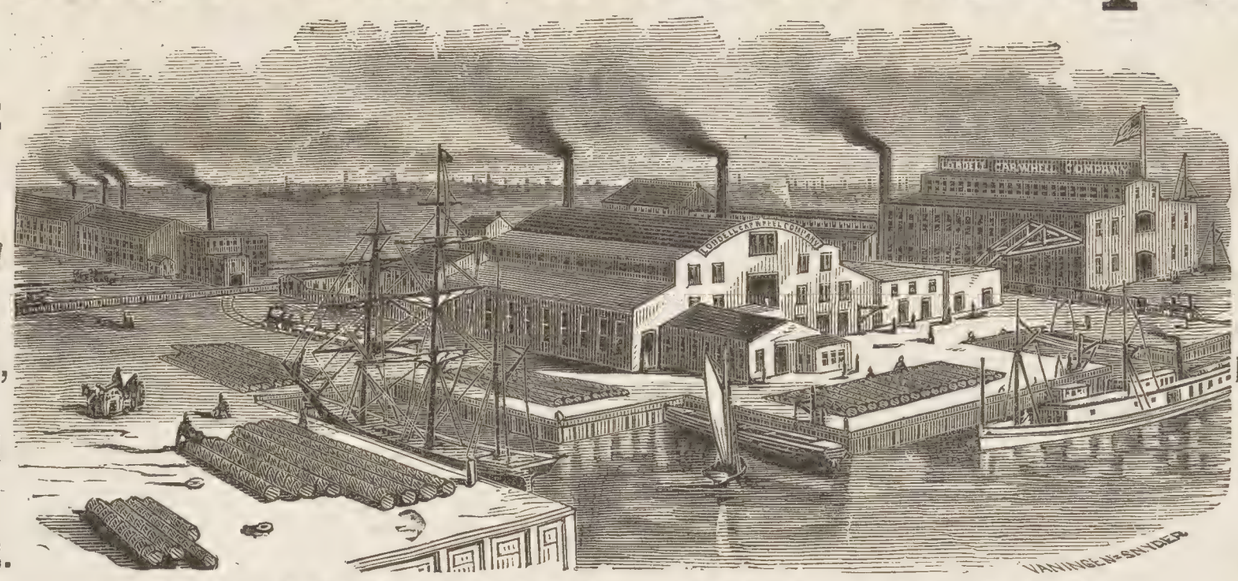
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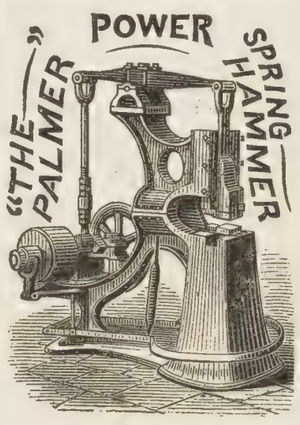
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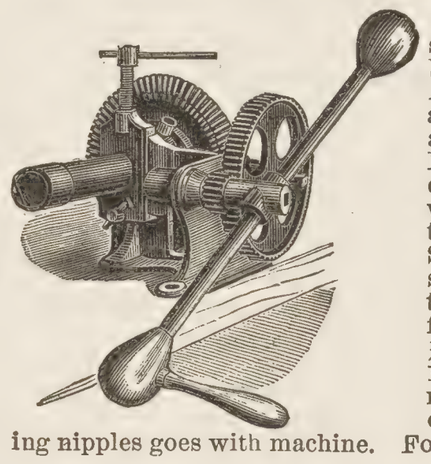
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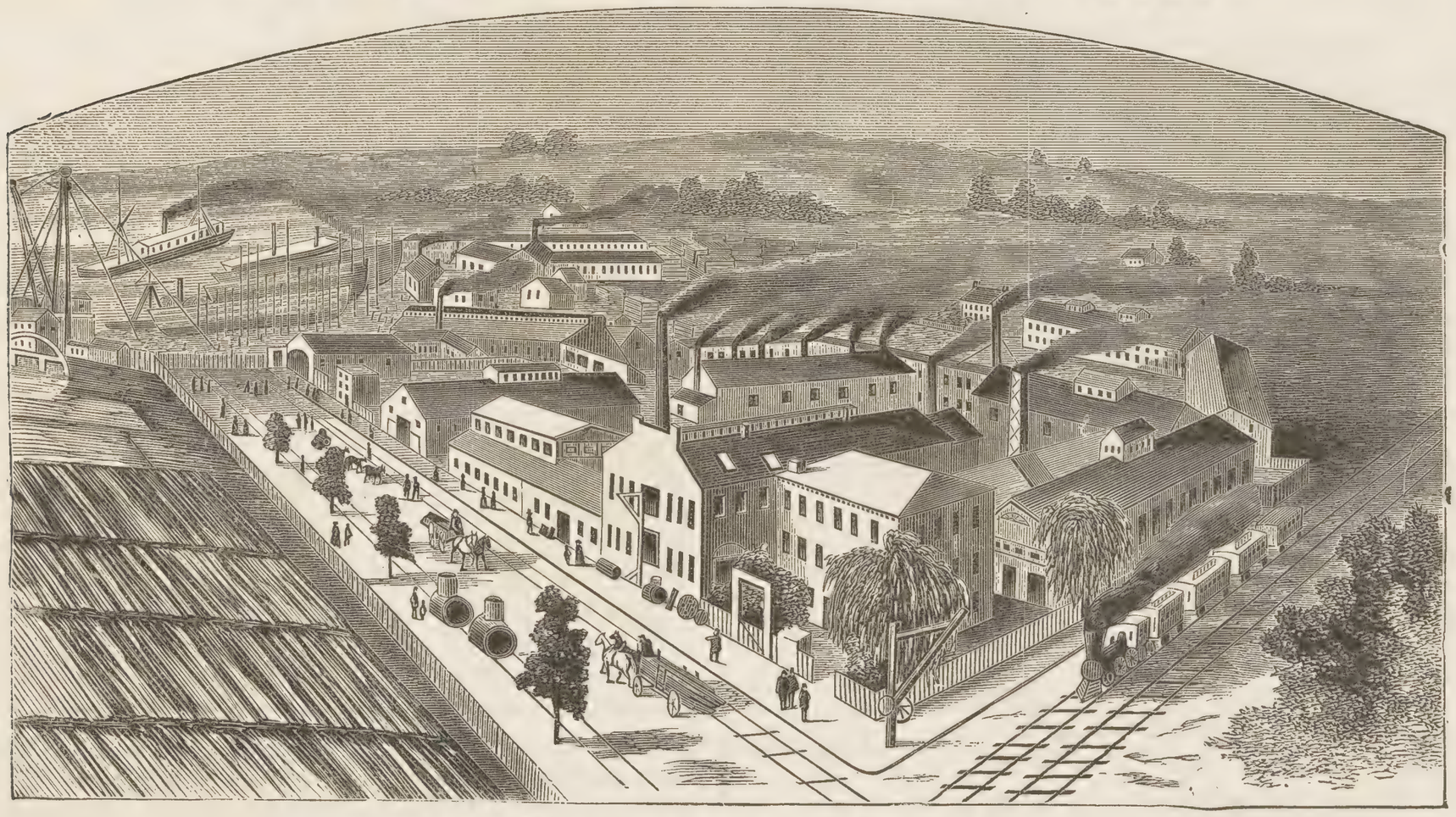
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BUILD ALL KINDS OF

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FIRST and SECOND-CLASS DRAWING-ROOM, SLEEPING, BAGGAGE, MAIL, and EXPRESS, BOX, and FLAT.

MURPHY & CO., NEWARK, N. J.,
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We call attention to the following prices of our Varnishes especially adapted to Railway Uses, and submit that they combine more prominently than any others, the INDISPENSABLE REQUISITES for Railway Consumption. They are of heavy body, light color, quick drying, and are guaranteed to give a maximum of durability.

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UNIFORM SUPERIORITY IN QUALITY AND FIXED PRICES TO ALL will continue to characterize these goods, and Satisfaction in their use is assured.

THE PULSOMETER,



APPLICATION TO RAILROAD WATER-STATIONS.

The above cut represents the Pulsometer in position, supplying a locomotive tender from an adjacent stream by the use of the steam from the locomotive itself. They are fitted with flexible steam connection and adjustable delivery pipes, always ready for instant use, thus doing entirely away with the expense of water tanks, pumping engines, and local engineers at watering stations on railroads. Adapted to take water from any creek, river, or well within reasonable distance and perpendicular depth from the track. Also for filling tanks at stations it will operate with great economy and certainty, and will do away with the use of piston pumps, and all the vexations due to steam-pump engineering. Simple, durable, and reliable. Railroads equipped with water-stations complete, and warranted to give satisfaction. Send for circular.

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THE DISNEY CAR COUPLER,

Patented June 24th, 1874. Manufactured by

F. E. CANDA & CO.,
CHICAGO, ILL.

Fig. 1.

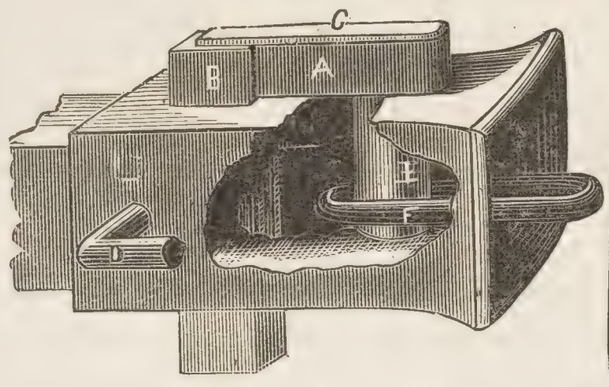


Fig. 2.

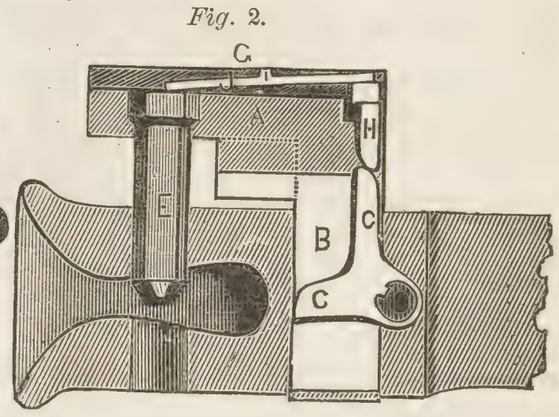


Fig. 1 represents the draw-head with a portion broken away to show the interior.

Fig. 2 represents a vertical, sectional view. *A B* we designate *The Drop*, the upper part *A* serving as the pin-holder. *D* is a lever by which the device is operated, fastened to a shaft passing through the draw-head. *C C* is a forked piece keyed to this shaft. *H* is a small loose pin. *E* is the large pin for securing the link *F*. *J* is a lever resting on the heads of pins *E* and *H*, with its fulcrum on cap-piece *G*. *Then*, when set for coupling or uncoupling, as in Fig. 2, the link *F*, in passing the mouth of the draw-head, raises pin *E*, which by lever *J* forces pin *H* against and displaces the upper arm of *C C*, allowing the *drop* to fall, carrying pin *E* with it.

From the above cuts and description it is apparent that this device combines simplicity in its construction, reliability in its working, and durability in all its parts.

We designate as points of special advantage:

That working from the side of the draw-head, it leaves no opening at the top for dirt, gravel, or accumulations of ice and snow to interfere with the working of the coupler.

That, while the link is always held in a horizontal position for entering, yet it has sufficient vertical movement to accommodate itself to cars of different heights, not exceeding a variation of six inches, without using the crooked link.

That the mouth of the draw-head is of such shape as secures the pin from all liability of bending or breaking.

That it always couples when desired, or set for coupling, and will *never* couple when not desired.

That, working readily from the top and sides of cars, there is no risk of life or limb.

That the pin can never be lost or stolen.

And further, that from its reliability of working, and durability of parts, combined with the device for securing it to passenger cars, makes *This Coupler* the safest and by far the most economical *Passenger Car* Coupler ever introduced.

The Disney Car Coupler, wherever tried or however thoroughly tried, has given the most perfect satisfaction, both as a Freight and Passenger Car Coupler.

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KATAHDIN CHARCOAL PIG IRON.
O. W. DAVIS, Jr., Manufacturer, BANGOR, MAINE.

SOUTH BOSTON IRON CO.'S TESTS OF KATAHDIN PIG IRON, 1874:

	Density.	Tensile strength per square inch.
No. 2 Pig Iron,	7,2002	18,894
" 3 "	7,2432	26,928
" 4 "	7,2305	30,765

Nos. 1 and 2 are soft and strong, suitable for machinery and fine castings, boiler plates and steel. Nos. 3 and 4 are close-grained and tough, adapted for steam cylinders, radiators, locomotive castings, car-wheels, hydraulic presses, etc. All grades contain less than one-tenth of one per cent of sulphur or phosphorus. Shipped by rail or water from Bangor to any part of the country.

THE NATIONAL CAR BUILDER.

DEVOTED TO THE INTERESTS OF RAILWAY ROLLING STOCK.

Vol. VI. No. 3. | MARCH, 1875. | *$1.10 per Annum. Single Copies, 10 Cents.*

Machine Belts.

In a recent paper read by John W. Sutton, M.E., before the New-York Society of Practical Engineers, the author made the following observations:

"While the use of belts for the transmission of power is not an American invention, the numerous improvements made in this country have caused it to be known in Europe as the American system. In Europe the greater part of the power is transmitted by cog-wheels, but in this country 99 per cent is transmitted by belting. The latter is used every where from the sewing-machine to the 500 horse-power engine of the largest factory. Belts can be run in any way, at any angle, of any length, and at any speed, and can be put up by any one of ordinary skill. They can be made of any flexible material—leather, rubber, gutta-percha, cloth, paper, raw hide, cord, or wire—and they may be either round or flat; and the last novelty is a sheet-iron belt, and it is said to work well. Every one uses them. While so handy and so popular, they have one fault. They are not positive. If you start from the motor with a certain number of revolutions, you lose a portion of them with every belt used. This is the only fault of the system. It is noiseless, yielding, and regular, but, unlike cog-wheels, it is not positive. The number of revolutions that are lost may, and do, vary continually by changes of the load or of the atmosphere.

"Belts derive their power to transmit motion from the friction between the surface of the belt and the pulley, and from nothing else, and are governed by the same laws as friction between flat surfaces. The friction increases regularly with the pressure. The great difference often observed in the friction of belts is due simply to their elasticity of surface; that is, the more elastic the surface, the greater the friction. The old rule 'that the number of inches in contact, multiplied by one half the velocity of the belt in feet per minute, and divided by 33,000, would give the horse-power,' might give it once in a hundred times, but not oftener. The rule is that a belt holds upon a pulley as the tension (pressure), and as the square of the degrees of wrap. A belt wrapped one quarter around a pulley, has only one fourth the power of a belt wrapped one half around the same pulley with the same tension. A line around a post will give a good illustration of this. One half a turn and a man's weight is doubled, while a full turn and his weight is nearly enough to stop a heavy boat, and two turns and his weight will stop the boat or the line will part.

"Belts always run to the high part of a pulley when the shafts are parallel; but when they are not, the belt will always run toward the ends of the shafts that are nearest together, and this tendency is much stronger than to run to the highest part of the pulley. If you have a belt that gives trouble in this way, you can see if it is the fault of your shafting by drawing a line across the edges of the two pulleys. Sometimes the bearing may be in line, but the tension of your belt is so great as to spring the shaft, so as to throw the pulleys out of line. A stiffer shaft or another bearing is the remedy. Leather and rubber belts each have their advocates, and each party say theirs is very much better; but each kind is better in its place. Where the belt is clear, a rubber belt will transmit 20 per cent more power with the same tension, and will last as long and run perfectly straight. It can be made of any length or width, of exactly the same thickness in every part, perfectly smooth on its surface, and when in use every part will come in contact with the face of the pulley. The greater tractile power of a rubber belt is due to its surface elasticity. Leather belts have to be made from pieces, and, as the leather is not perfectly flat, a perfectly flat belt can not be made from it. If a belt is cut from the back of a hide, the edges are not so firm as the center, and upon a crowned pulley they will not hug as well as if they were of the same firmness as the centre. If the belt is cut from one side of the back, then one edge will be less firm than the other, and the belt will be crooked, and one side will have more tension than the other. Leather belts are usually riveted at the joints. Now, if a rivet-head touches the pulley, the friction is less than if the leather touched. If the head is above the surface of the belt, then a portion of the belt is not in contact with the pulley; and if the head is below the surface of the pulley, then, of course, there is no contact. Now every rivet in a belt is in one or the other of those positions, and leather belts would be improved by using something else in their place. Double leather belts are used more than single ones, but it is clearly a mistake, as a single leather one will transmit more of the power than a double one. If you look at the face of a leather belt, you will see when it has been used for a time the face has a mottled appearance, light and dark, showing how much of the surface of the belt has been in contact with the pulley. If an average of one inch of width has not touched, then you have paid for one inch of belt that is of no use, but is really a detriment. Double leather belts run straighter than single ones, as the flank side of one part can be put against the back of the others. A double belt will stand a greater tension than a single one, but a single one will stand all that should be put upon any belt. The cost of belting is increased every year, and it is well to look out for the belt of the future. Not impossibly it may be made of low steel, of great tensile strength, and run upon pulleys with an elastic surface to increase the friction. A sheet-iron belt, running upon cast-iron pulleys, is now, we believe, in successful operation in Pittsburg. But we have a hundred instances of the steel belt upon an elastic surface pulley in this city, in the band-saw, and one of a large saw-mill sawing logs with a band-saw about three inches wide. Now a band-saw is a belt, and the power to do work is all derived from the friction between the band-saw and the lower pulley. In the case of the saw-mill spoken of it amounts to from 10 to 15 horse-power, and this is all transmitted by the saw itself. It may be said we can not get belts of steel wide enough to take the place of our large belts. Whenever such belts are wanted they will be made of any width and length asked for. Belts of the present make are run with a strain of one fifth their strength, and as the strength of low steel is over 100,000 pounds to the square inch, a belt one foot wide and one eighth of an inch thick would have a strength of 150,000 pounds or more. One fifth of that would give us 30,000 pounds; this strain upon an elastic surface pulley of say 16 feet running at a speed of 2000 feet per minute, would give us a belt with the power to transmit over 1800 horse-power. If the belt were one sixteenth of an inch thick it would be able to transmit 900 horse-power. We have no belts now capable of any thing like this. How will this belt be joined? When the band-saw first came out that was looked upon as the stumbling-block in its way, but to-day they are joined without a thought, and in about the same time that it would take to join a belt of leather. The steel belt would be joined in the same way. Whether this steel belt is the belt of the future or not, there will be wanted a better and cheaper one than we now have, and it is to the practical engineers that we are to look for it."

A New Atmospheric Brake.

A continuous brake invented by Mr. R. D. Sanders, late of the Great Indian Peninsula Company, has been tried in India under the inspection of the Government consulting engineer, who was very much pleased with its operation. The principle upon which it is worked is the reverse of the method used in other forms of atmospheric brakes, the power being used to release the pressure upon the wheels instead of applying it. The following description is furnished by the inventor in bringing his device to the attention of the public.

"The brakes in their normal condition are 'on,' and the blocks are withdrawn from the wheels by the aid of atmospheric pressure, my method of utilizing which has enabled me to dispense with all valves, pistons, cylinders, complicated couplings, and all parts likely to get out of order. The means by which these advantages are obtained consist of an exhausted pipe, extending the entire length of the train, and a steam jet on the engine, by means of which jet the pipe on the train and the appliances in connection therewith are exhausted. The pressure of the atmosphere is thereby made use of for removing the blocks from the wheels, not to apply them, as in other forms of vacuum brakes, so that, in the event of the vacuum in the pipe being destroyed, the brakes are applied throughout the train by means of weighted levers, which are applied in such a manner as to force the blocks against the wheels. The pressure of the atmosphere is also made use of for closing a steam-whistle on the engine and air-whistles in the guards' vans, so that in the

event of the vacuum being destroyed by the separation of the pipes between the carriages, or from any cause whatever, the attention of the driver and both guards is simultaneously attracted.

"I have before alluded to other forms of vacuum brakes, and I wish here to draw particular attention to the time which is required to apply the brakes by the pressure of the atmosphere, and that which is necessary by my improved method of doing so in the contrary direction, as already explained above. In the former case the time required is that which is necessary to exhaust the pipes and create the necessary vacuum; in the latter it is that only which is required to destroy it by admitting air into the pipes, which practically is instantaneous. In those forms of brakes in which the blocks are pressed against the wheels by the pressure of the atmosphere, it is obvious that the force with which the brakes are applied must be in proportion to the pressure of the compressed air, or the power of the vacuum in the pipes and cylinders, so that, should the power-producing apparatus from any cause become ineffective, the brakes must also inevitably be rendered useless. Again, in the event of an accidentally divided train, it is evident that unless means are provided for closing the ends of the pipe where the separation occurs, and for maintaining the pressure of the air or vacuum in the rear portion of the train, accidents might arise on a level road from the rear portion overtaking the front portion, and also from the rear portion breaking away on steep inclines. These contingencies have been provided for by valves in the couplings connecting the pipes between the carriages, and by the use of auxiliary air receivers on the carriages and air-pumps in the brake-vans, which, although they may be effective, are unnecessarily complicated and difficult to keep in perfect working order. These disadvantages are entirely obviated by the use of my improved atmospheric brakes and method of working them, in which the force with which the blocks are applied to the wheels does not in any way depend upon the efficiency of one power-producing apparatus, but upon the power of the weighted levers attached to each individual carriage, from which it is evident that the smallest movement is all that is required to allow the weighted lever to bring the brakes into action, and they can therefore be applied in much less time than by the use of pistons or expanding cylinders.

"In the event of an accidentally divided train, whether upon a level road or upon an incline, the brakes will be simultaneously applied throughout both portions of it without the aid of self-closing couplings, auxiliary air receivers, or tripping apparatus. In a level road or descending gradient, a collision will be averted by the momentum of the engine carrying the front portion of the train forward clear of the rear portion, which will be brought to a stand within practical limits. Upon ascending steep gradients the instantaneous action of the brakes will be particularly serviceable, as the rear of the train will, in the event of an accidental separation, be brought to a stand before it commences to recede. This is of the greatest importance where pushing engines are not employed, as considerable difficulty is frequently experienced in overcoming the momentum of the train which it is allowed to acquire by the lapse of time in applying the brakes by the ordinary hand appliances. This means of communication throughout the train provides against the possibility of a driver starting from a station and leaving a portion of his train behind; for it is evident that unless his train is complete, and the apparatus throughout in working order, the whistle on the engine will continue to sound when the steam is turned on to the jet for producing the vacuum before starting. The whistle will not close until the vacuum is created. This constitutes a starting signal, and it is therefore impossible for a driver to proceed with his train without knowing previous to starting whether or not the brakes are in such working order as to be relied upon when required. Should the whistle not close, it will indicate some defect, and if he should then be required to proceed, he would do so with the full knowledge that the brake-power in his train was limited to that provided by the engine and the brake vans, and this would enable him to act with more than ordinary care in case of emergency, instead of running into danger without the means of preventing accident."

Reed's Self Car-Coupler.

THE engravings represent, in longitudinal section, two draw-bars of the ordinary pattern, showing the attachment and working of the coupling device. The peculiar feature of the arrangement is the cast-iron weight or tongue, D, in which is a *chilled* oblique hole for the reception of the coupling-pin. The coupling process is shown in Fig. 1, where the tongue acts as a weight to hold the pin, C, in position to enter the opposite draw-head. Fig. 2 shows the draw-head in readiness to receive the link, the tongue resting on the bottom, and the pin at the entrance of the hole ready to drop to its place and complete the coupling when the tongue is raised by the entering link so as to bring the oblique hole in vertical line with the holes in draw-bar. The tongue may be attached, as shown, to any draw-head. The old link and pin can be used, also a bent or straight link. It will also couple with straight link when draw-bars vary in height. The tongue may be hinged near the top or bottom of draw-bar.

Fig. 1.

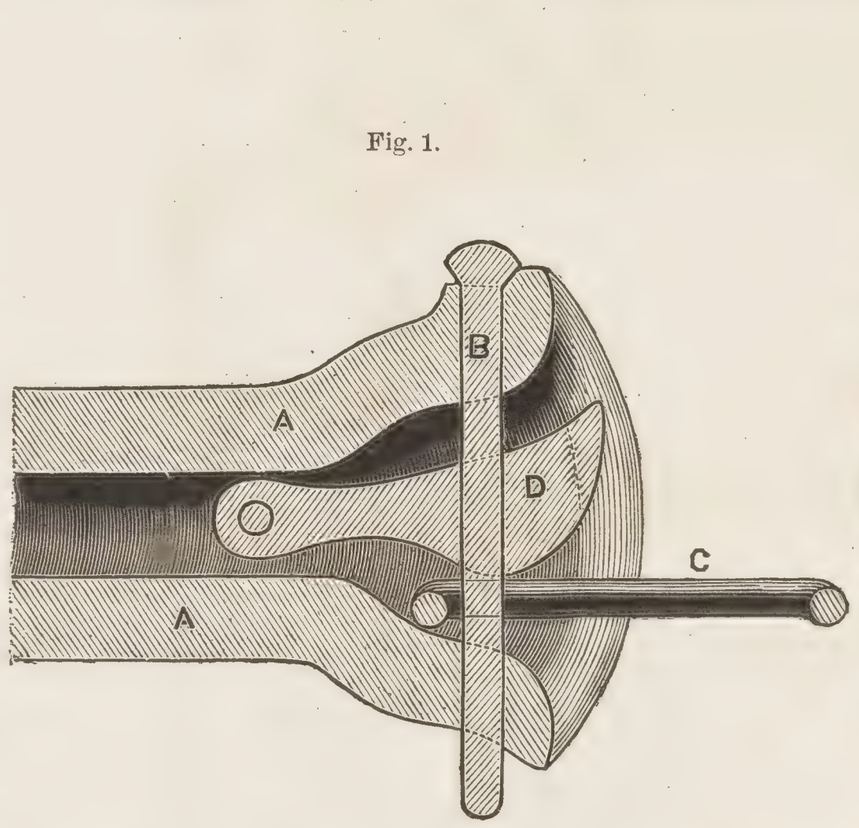
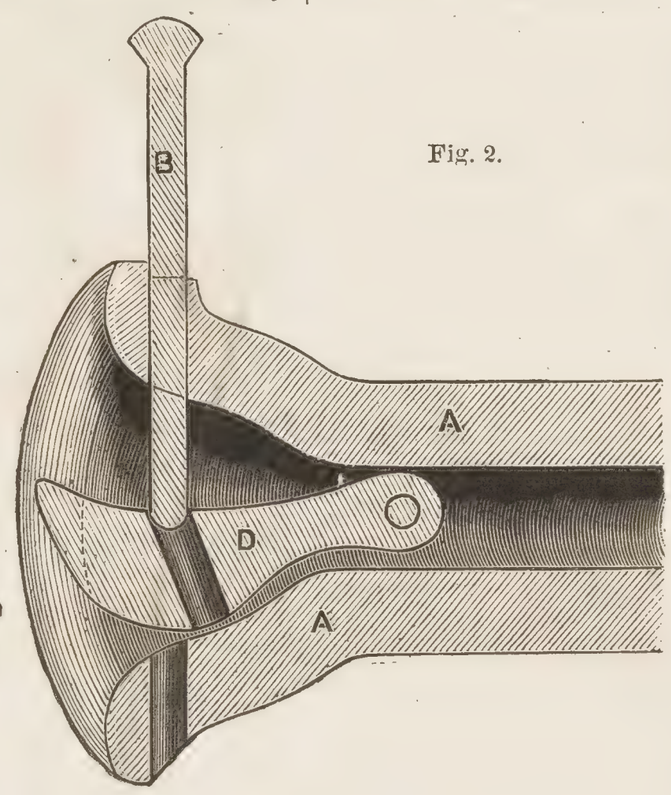


Fig. 2.



The advantages claimed for this method are its simplicity, cheapness, and durability. It is particularly adapted to freight-cars, and has been approved by master mechanics and car-builders as one of the very few practicable self-couplers. For further information in regard to it, communications may be addressed to the patentee, Joseph V. Reed, P. O. Box 234, Jeffersonville, Ind.; or J. R. Parker, Purchasing Agent L. N. A. & C. R. R., New Albany, Ind.

MR. WILLIAM WILSON has been appointed master mechanic of the Chicago, Burlington, and Quincy Railroad, in place of Mr. George Chalender, lately appointed superintendent of the locomotive and car department of the Michigan Central Railroad.

The New-York Elevated Railroad.

THIS road will always be referred to in the future as the pioneer of rapid transit in New-York City. It has been in successful operation for about three years, and extends from the Battery to 34th street, a distance of 3¾ miles. A recent report of the President of the Company states that with all the disadvantages attending its operation, the road has carried over 1,800,000 passengers without injury to a single one, and that over 800,000 have been carried during the past year. The rails from the Battery to 30th street are laid upon longitudinal girders formed of two iron plates with a piece of timber between, the timber constituting the bearing for the rails. The supports of the girders are from 30 to 50 feet apart, which causes considerable deflection of the latter from the weight of trains. To obviate this, the girders are trussed; some with plate and some with round bar-iron. The report recommends the use of wooden cross-ties, 18 inches apart, so as to make the rails adjustable independent of the girders, and that any new extension of the track be so constructed. That portion of it above 30th street has iron ties, 4¼ inches wide and 31¾ inches apart, which form a rigid bearing. This is found to be objectionable for many obvious reasons. The present motor-power seems to be all that is desired. The dummies, while weighing but five tons with water and fuel, draw three loaded passenger-cars with ease. These cars weigh about 9500 lbs. empty, and have seating capacity for 40 persons.

At present there are no turn-outs, and the trains have to run backwards from the upper to the lower terminus, requiring 35 minutes for a round trip. By putting in two turn-outs, it is estimated that the capacity of the road would be more than doubled, and enable trains to run both ways once in 18 minutes. By extending the road to 59th street (Central Park), a distance of 5 miles from the Battery and 1¼ miles from the 34th street terminus, and providing it with the necessary equipment and turn-outs, an average of a car every 1½ or 2 minutes each way could be run, and the number of passengers far exceed any estimate that may now be made. The plan of single-column supports for the roadway is approved as being a simple, safe, and economical method of construction. The columns which sustain the present track are fully capable of supporting any vertical weight that may be thrown upon them in the operation of the road; but some additional bracing is recommended to reduce the present small degree of oscillation so it would be unappreciable. The officers of the Company are Milton Courtright, President; Wm. L. Wallace, Vice-President; and Daniel W. Wyman, Superintendent.

THE first-class railway-carriages in Austria are very handsomely finished inside, gilding, costly woods, velvets, mirrors, and silk curtains being used with a lavishness not always characterized by good taste. Many little conveniences are provided in the fitting up, but are so poorly arranged that after all the carriages are very imperfect. In regard to the method of lighting them at night there appears to be much reason for dissatisfaction, as the light is very unevenly distributed. On the Austrian lines they have fourth-class carriages, which are wholly destitute of seats. These might suggest the need of a society for preventing cruelty to poor folks.

Fancy Woods.

THE fashionable veneer to-day is what is commercially known as French walnut, though why this wood should be so termed is one of those things that "no fellah can find out." It all comes from Persia and the shores of the Black Sea, Liverpool being the great distribution market. In Europe this wood bears the more appropriate name of Circassian walnut, and its designation among us was probably introduced as a shrewd device by importers who were aware of the popular prejudice in favor of everything French.

Rosewood, though it has of late years fallen somewhat from its high estate, is still esteemed one of the most important of all fancy woods. Formerly many articles of furniture were made of solid rosewood, but now this is never done except when some person of old-fashioned tastes specially orders a set of that kind. The great and sole use for rosewood is in piano-making, and the prominent position which this industry has attained in the United States may be seen from the fact that the imports of rosewood exceed in value those of any other of the distinctive "fancy" woods. In England many pianos are made of Circassian or French walnut, but in this country no kind of wood can be used for the purpose that is at once so cheap and so ornamental as the beautiful product of the Brazilian jungles.

Rio Janeiro and Bahia are the great markets for rosewood in its unmanufactured state. Considerable quantities are produced in the Canary Islands, and occasionally a lot finds its way to Europe from Siam, that favored region for the growth of an almost endless variety of rich and perfumed woods. Almost the only importing market in this country is New-York. During the year just closed, the merchants of that city imported about $140,000 worth, against $143,500 worth the previous year, a very favorable showing for a period when the falling off in the demand for articles of luxury has been so universal. Rosewood is worth, according to soundness, tint, and figure, all the way from five to twenty-five cents a foot.

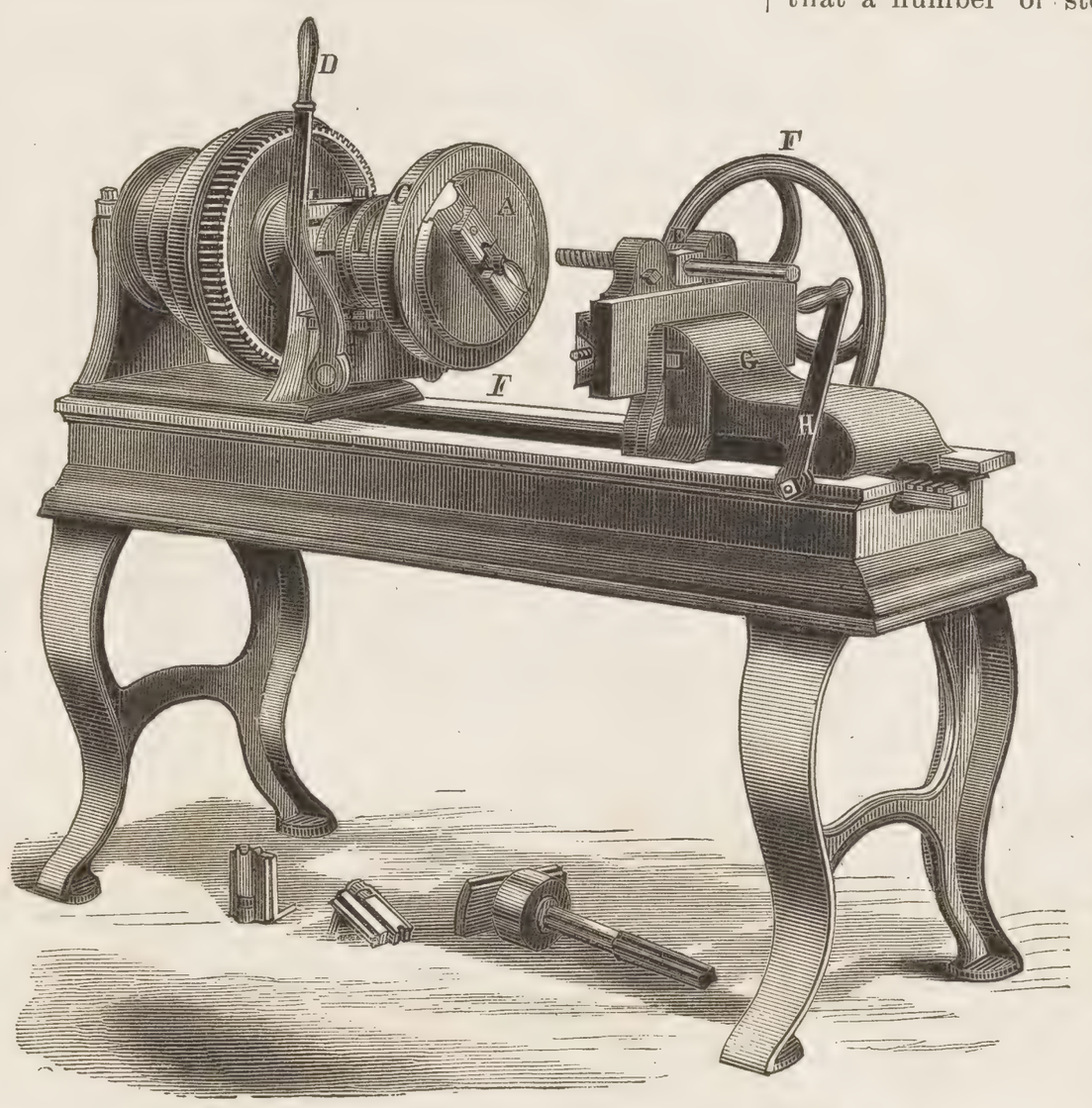
Africa's quota in the matter of fancy woods is supplied by three varieties—ebony, thuya, and amboine. The first-named is by far the most important, and is indeed one of the leading woods in the whole list. Ebony is imported from both the east and west coast, but mainly from the former. Boston dealers, as well as many in New-York, are supplied by direct importations at this port. In Africa the great market is Zanzibar. An invoice of Madagascar ebony occasionally comes here by way of Australia, a prosperous trade having been established between that colony and the African island. Ebony is chiefly employed in making keys for pianos and handles for cutlery ware. Flutes and many minor articles are also made of this wood. When sawed it is worth from ten to fifteen cents a foot, and in the log from three to eight cents a pound.

A very rare and costly wood, called thuya, has been imported in small quantities during the past four or five years. In the form of fancy tables, boxes, etc., a small demand has been created for it. A pound sells for from a dollar and a half to two dollars. Both this and amboine, a similar wood in every respect, are imported from the west coast of Africa.

Of the fancy woods produced in Europe, Hungarian ash is the only variety that meets with much favor in this country. It grows in Hungary and on the high Alps. Veneer manufacturers use a good deal of it in railway-car work and for various articles of parlor furniture. When cut the price per foot is from three to twenty cents.

Of the great variety of beautiful woods produced in the United States few are estimated at their true value. The delicate bird's-eye maple, which is native to New-England, New-York, and Michigan, is much better appreciated by foreigners than by our own people. Heavy shipments have been made to England, where it is in demand for such purposes as the interior finishing of ships' cabins and railway-carriages. Like many other American woods, bird's-eye maple would probably be much more extensively used here if we were obliged to import it. Burl, blister, and bird's-eye are varieties of both walnut and maple, and are thus called from the natural figure of the woods. Ash burl is largely used in general veneering. This and bird's-eye maple are sometimes dyed, the most common color being a silver-gray. This is only done on ordered work. The wood of the butternut and the oak, when containing burls, is used for veneers.

A comparatively new wood in this part of the country is the California redwood. Burls are very rare in this wood, and strips containing them are worth from ten to twenty cents a foot. California laurel burl is even higher in price, twenty-five cents a foot being the figure obtained for the best descriptions. Naturally enough the demand for these woods has greatly fallen off since the panic.—*Com. Bulletin.*



Improved Bolt-Cutting Machine.

THE engraving illustrates one of the best and most complete bolt-cutting machines in the market. It will cut all sizes from ¼ upward to 3 inches, and is claimed to have no equal in practical efficiency and economy of running, as well as ready adaptation to all kinds of work occurring in a machine-shop.

The mandrel is hollow, and on its end is keyed the face-plate, A. To this are fitted as many pairs of slides, with dies fitted, as there are sizes of bolts to be cut by the machine. The dies are prevented from slipping in the slide by means of adjustable screws fitted in the outward ends of the same, with their heads resting against the outward ends of the dies. The sliding ring, C, is fitted to the face-plate, and moves freely upon it, by means of the lever, D. On the ends of the slides are projections forming a part of the slides (two of which are represented under the machine). These projections are inclined planes, and on the inside of the sliding ring C are corresponding female inclined planes, into which these on the slides are well fitted. When the face on the ring C is brought to the same plane with the face of the face-plate A, the dies are closed and ready to receive the bolt, which is entered into the dies when closed and run on the desirable distance. The top of the lever D is then moved toward the cone, which causes the dies to open, and the bolt is then withdrawn by the aid of the crank, H, without stopping or reversing the machine.

It is evident that by discarding solid dies, much time is saved, as no backing off is required, the opening of the die relieving the bolt at once, while also the objection that a solid die becomes at last larger by wearing out, is avoided. Nuts are cut as easily as bolts, being held by the same jaws and run across the threaded portion of the tap until its long shank is filled; then the tap, which is fitted to the chuck in a square socket, is removed and the nuts slipped off, the tap restored, and the operation repeated.

Two sizes of these machines are made, Nos. 1 and 2, and their operation is heartily approved by many prominent manufacturers. They are manufactured by Mr. P. Hickey, successor to Babbett, Hickey & Co., Auburn, N. Y. We refer to advertisement in another column.

Cork as a Non-Conductor of Heat.

A COMPANY has been organized in Paris for the purpose of thoroughly testing the well-known remarkable non-conducting property of cork. It appears that a number of steam-pipes at several important establishments had been covered with this substance; but the test of continued application was wanting. More recently, however, it has been stated that after standing eighteen months, the cork covering has remained intact, and is as perfect a non-conductor as on the day it was laid. Although the durability of this substance had been proved before by the buoys, which are partly immersed and partly exposed to the weather, its being able to stand such high temperatures as those of surfaces heated by steam at from seven to eight atmospheres had not hitherto been shown.

Now, felt, which is a good non-conductor of heat when first laid, deteriorates very rapidly; although retaining its original appearance, it ceases to be effective after a few weeks, and ultimately tumbles into dust.

A fear of the same result occurring in the case of cork would, no doubt, be entertained by those who are unacquainted with its nature, but not by those who know the composition of this remarkable wood-like substance. To set all misgivings at rest, however, nothing is so satisfactory as actual experience, and there is no doubt that cork is now firmly established as the non-conductor par excellence. Its lightness, the readiness with which it yields so as to surround the cylinders or pipes it may be destined to encase, the facility with which it is put in its place, taken down, and put up again in the case of an inspection or repairs to a boiler or steam-pipe, and, above all, its non-conducting power, effecting so great a saving of fuel, assure for it the highest place in the eyes of all manufacturers who regard their own interests.

The engineers of the French navy have made experiments on cork employed as a non-conductor, and have reported thereon to the Admiralty, which body has requested the manager of the company to appoint, at the five military ports, agents to attend to any orders which may be given. This *cachet* given by men so reserved as the French naval engineers at once places cork in the first rank as a non-conducting substance.—*Ex.*

THE shops of the Northumberland Car and Manufacturing Co. are to be turned into a rolling-mill and nail factory.

A New Passenger-Depot in Boston.

THE Boston and Providence Railroad Company has just completed its new passenger station, which is the finest in New-England, if not in the United States. The exterior of the structure, with its architecture of modern Gothic, its lofty tower, with the largest clock-faces in Boston, its picturesque gables, long train-house, and pleasing combinations of smooth brick and sandstone, have been for a long time familiar to the public; but its interior has been unknown, except to a favored few who have now and then been admitted. Every part is in perfect harmony and keeping, the Gothic design being preserved throughout, even to the smallest details of furnishing. Nothing is wanting to promote the convenience and comfort of passengers. The result is an appearance of palatial luxury, combined with an effect of solidity and tasteful construction such as are generally the last things to be expected from a railroad and its accompaniments, and which but a few of even the most famous hotels can show their guests. There is a *café* equal to any in the city, in charge of the most skillful of cooks.

The gates of the main entrance are of wrought iron, beautiful and massive, producing of themselves an imposing effect. Once inside the grand porch, 24 by 34 feet in dimensions, a sense of symmetry of proportion and finish of detail surprises the eye on every hand, confessing at once the handiwork of master artists. The floor is composed of different colored encaustic tiles. On opposite walls, two tablets of polished marble bear the names of the original and present officers of the road, and form a permanent record of other facts of interest. The great marble hall is 180 feet long, 44 broad, and 80 high. The polished granite columns, with elaborately-carved capitals of sandstone; the ceiling and finish of the hall in ash; the open-timbered roof, with hard-pine trusses; the beautifully-tinted walls and stencil-work, are unaccustomed sights in a structure of this character. But the prominent feature of this hall are the Gothic fountains of white marble, cut into novel designs. Twenty-one feet above, running around the entire room, is a gallery. At the further end is one of Howard's large clocks, while a large rose-window of stained glass appears at the front end. This immense hall is lighted by 44 separate clusters of gas-jets, 22 pendant from the galleries, and the remainder fixed on upright supports above them. A number of marble-topped steam-radiators furnish ample heat.

The first room entered on the left, on the Columbus avenue side, is a smoking-room, fitted in the most elegant and luxurious manner. From this room opens the gentlemen's room proper, also accessible from the hall, 44 by 60 feet. Next in succession are the ticket-office and the ladies' room, 50 by 60 feet. The visitor is at once struck with the conveniences offered. Both the package-room and the ticket-office open into each of these waiting-rooms, the latter also opening into the hall as well. The upholstering and highly-polished ash finishings are uniform in both these rooms. Upon the walls are painted maps of Long Island Sound and the Shore Line to New-York, with all the railread connections. In addition are the different stations, with their distances on the Boston and Providence; Hartford, Providence and Fishkill; Providence, Warren and Bristol; New-Bedford, and Providence and Stonington Railroads. This novel and convenient arrangement originated with Superintendent Folsom, and will prove of great convenience to the patrons of the road.

Next to the ladies' room is a corridor leading to the Columbus-avenue entrance. On the right is the baggage-room, the last room on the left-hand side of the hall, so arranged as to avoid the shifting of trunks within the passenger portion of the station. At this entrance, on the outside, a large space is reserved for hacks. Passing from the porch, the passenger enters the corridor, presents his trunk at the baggage-room on his left, receives his check therefor, passes on a few feet, and is in the great hall, whence, by opening doors at his left and at the extreme end of the building, he can pass to the train or may enter any of the rooms opening from the main hall.

The opposite side of the building is devoted to private retiring-rooms; the telegraph office is at the end nearest the Park-square entrance. Then comes the large and convenient retiring-room, at the end of which is a corridor leading to Providence street. In the rear of the news-room is a fully-equipped barber-shop. On the right is the entrance to the *café*, an elegant room in every sense of the word, 60 by 40 feet. The walls, which throughout the rest of the building are of a light tint, are here colored dark brown, and the black-walnut sideboards add still further to the magnificent fittings of the room. Leading from the *café* is a private dining-room, 14 by 16.

Opening from the gallery are the rooms of the directors and other officers, all in keeping with the other parts of the station in point of elegance, convenience, and comfort. The room allotted to Superintendent Folsom is 24 by 34 feet, into which run telegraph-wires, tubes, bells, etc., etc., and these same necessary appliances are connected with the rooms of the President and station-agent. Mr. Folsom also has a private room, 14 by 12, fitted up in a luxurious manner. At the opposite or near end of the gallery, are located a store-room, a travelers' reading-room, 14 by 18; an unoccupied room, 20 by 30; a billiard-room, 30 by 50, and the kitchen and bake-room, the latter being over the *café*. The total dimensions of the head-house are 212 feet in length, and an extreme width of 150 feet. The train-house is 538 feet long and 130 wide, and the great iron trusses, with 125 feet span, cover five tracks, with three platforms. In the cellar are placed four large boilers of the Campbell, Whittier & Company's make, two of which only are in use at present, and heat is by them supplied to the whole building.

The architects of the building are Messrs. Peabody & Stearns, and the entire cost is nearly a million of dollars.

Car-Trussing and Dead Weight.

To the Editor of The National Car-Builder:

DEAR SIR: How to get rid of dead weight is a prevailing hobby among car-builders, and if the nag is not judiciously managed there is danger that it may be ridden to death before the reform, which all are aiming at, is accomplished. As regards the means and methods of reducing the weight of cars, there is much diversity of opinion. When a weak place is discovered in the framing, it is usually strengthened by increasing the size of the timbers, which of course adds to their weight. This is very often done; but, as I shall attempt to show, it is not always the wisest plan.

Much superfluous weight, as it seems to me, might be avoided by a proper use of truss-rods. In passenger-car trucks, for example, the cross centre-timbers or transoms—the "Dictionary" must determine which is the proper term—are not usually trussed, but a tie-rod or joint-bolt hold the side or wheel-timbers to them. When fastened in this way the transoms have a natural tendency to get down in the centre, and to prevent their doing so they are frequently made larger, instead of changing the tie-rod into a truss-rod. The plan adopted by the Barney & Smith Manufacturing Co., of Dayton, Ohio, is a very good one. It consists of a $\frac{3}{4}$-inch square iron rod let into the transoms flush on each side, the ends of the rod being round and fastened with $\frac{3}{4}$-inch nuts. This costs no more than joint-bolts or tie-rods; the transoms may be of lighter timber, and they can at any time be tightened up. This method can also be applied to side-timbers, which sometimes get down an inch or two at the centre. In the ordinary "diamond" or Cleveland freight-truck, these timbers are trussed in various ways; some have truss-rods in the spring-plank only, some have them in the bolster, some in both, and some have none at all. No matter how much space there may be between the side-bearings and body-transom when the car is new or empty, the car-body is sure to settle down until there is as much weight on the side-boarings as on the centre-plates, causing trouble in curving and switching. Many car-builders, instead of trussing the bolster, will add from 2 to 4 inches to its thickness, and then complain about dead weight. There is some advantage in truss ing the spring-plank, as it tends to keep the arch-bars parallel and the oil-boxes level; but when the car is loaded, the weight will settle the centre-spring so that the bearings will be about equal.

The proper method of trussing this style of truck would seem to be to apply the truss to the bolster timber only, and dispense with a centre-spring. There would then be but little if any deflection from a straight line when the car is loaded. The usual way of doing this is by running 2 rods of $\frac{7}{8}$ round iron under the timber, and about ten inches apart. In the middle are 3-inch cast-iron studs, and at each end a plate with bevel nut face. Any deflection in the timber can be taken up by the nuts. In this way, if the body-transom is properly trussed, there need be no side-bearings, and the liability to jump the track at curves and frogs, strain on truck-frames, flange-wear, etc., would be very much lessened. With proper trussing, the size of timbers can be reduced; $4\frac{1}{2}$ x 12 would be sufficiently large. It would seem to be a needless precaution to truss spring-plank and bolster both, besides being a needless increase of weight. The "Fort Wayne" truck has too much dead weight. The two double posts weigh about 45 lbs. each, while 4 ordinary **T** posts weigh only 15 lbs. each, the latter number being sufficient for a truck and are more easily applied.

Most passenger-cars have from 2 to 4 longitudinal trusses. Those having but 2 intermediate sills with cross-framing, generally have but 2 trusses, one under each side-sill and bolted to sill near the transom, which of course is no support to the ends of car outside of transoms. Cars with 6 or 8 longitudinal sills have from 2 to 4 truss-rods; if but 2, they are placed just outside of second intermediates, running over the transoms and through the end-sills. Sometimes they are elevated above the transoms, which, in the opinion of some, is a support to the car-ends. There are various ways of trussing the body-bolster or transom—we believe the former term is the proper one, but the reader can take his choice. A very good plan is to run two rods of 1-inch round iron from the ends over two centre-sills, with nuts at ends of rods. Transoms trussed in this way may be of moderate size as compared with some we have seen; $5\frac{1}{2}$ x 14 is a very suitable size for passenger-cars, and 5 x 12 for freight-cars. They may be raised at any time, and side-bearings are scarcely needed; while with all other plans we have seen there is more or less weight on the side-bearings. An erroneous impression prevails among many car-builders that by increasing the size of transom timbers, or by inserting two or three plates of iron alternately with the wood, the centre can be kept on a line with the ends; but the probability is that in three months the ends will be down so as to bear as much on the sides as at the centre. There are of course many different ways of trussing both trucks and car-body, the essential point being in all cases to retain strength and dispense with weight as much as possible.

MINEOLA.

A DULUTH paper proposes a railroad on the ice from Duluth to the Sault—the whole length of Lake Superior. It claims that all that is necessary is to spike the rails to the ice, without grading, filling, excavating, ballasting, or ties. The track, it says, could be taken up every spring and stowed away. The road would be about 400 miles long, and a dead level. The ice lasts till April; is thick enough to sustain a train of cars; the freight-cars could be transferred to the ice without reloading, and the rails could either be spiked to the ice or they could be fastened in a frame and laid on the ice without spikes.

Atlantic and Great Western Passenger-Coaches.

THE shops of the Atlantic and Great Western Railway at Kent, Ohio, are now used exclusively for car-work, the locomotive department having been removed, about a year ago, to Galion. They are under the general supervision of Mr. S. V. Smith, the master of car-repairs for the road. Two first-class passenger-coaches have just been completed, which are not surpassed in substantial workmanship and tasteful finish by any others of the same class in the country. They are 50 feet in length and 10 ft. 4 in. wide, and, like all other passenger-train cars on the road, are equipped with the Miller platforms. The inside finishing is mahogany throughout, except sashes and blinds, which are walnut. The windows are elliptic, and the panel-work relieved with gilding. The wood-finish is separated from the head-linings by three strips of gilt moulding running around the car. No other gilt mouldings are used. The head-linings were painted in the shop, and are executed with a degree of artistic skill in design and color that secures a pleasing harmony throughout. They are not heavy, glaring, or overdone. The designs are more open, and lighter than they usually are, the effect of which is heightened by gold striping, and imparts to the car a light, airy, and attractive appearance. There are revolving sash-ventilators in the dome. Buntin's seat-frames are used, and the upholstering is of the best material. The outside finish is devoid of unnecessary ornament; the prevailing color is raw umber, relieved with light gilt striping and scrolling.

These cars make nine, in all, of the same class that have been built at these shops within the past two years. The average cost of each is $5150. Six of them were built for the United States Rolling-Stock Company, and the other three for the road. All of them are now running on the road; and the fact that those built at first are seldom in the shop for repairs, is an evidence that they are well constructed.

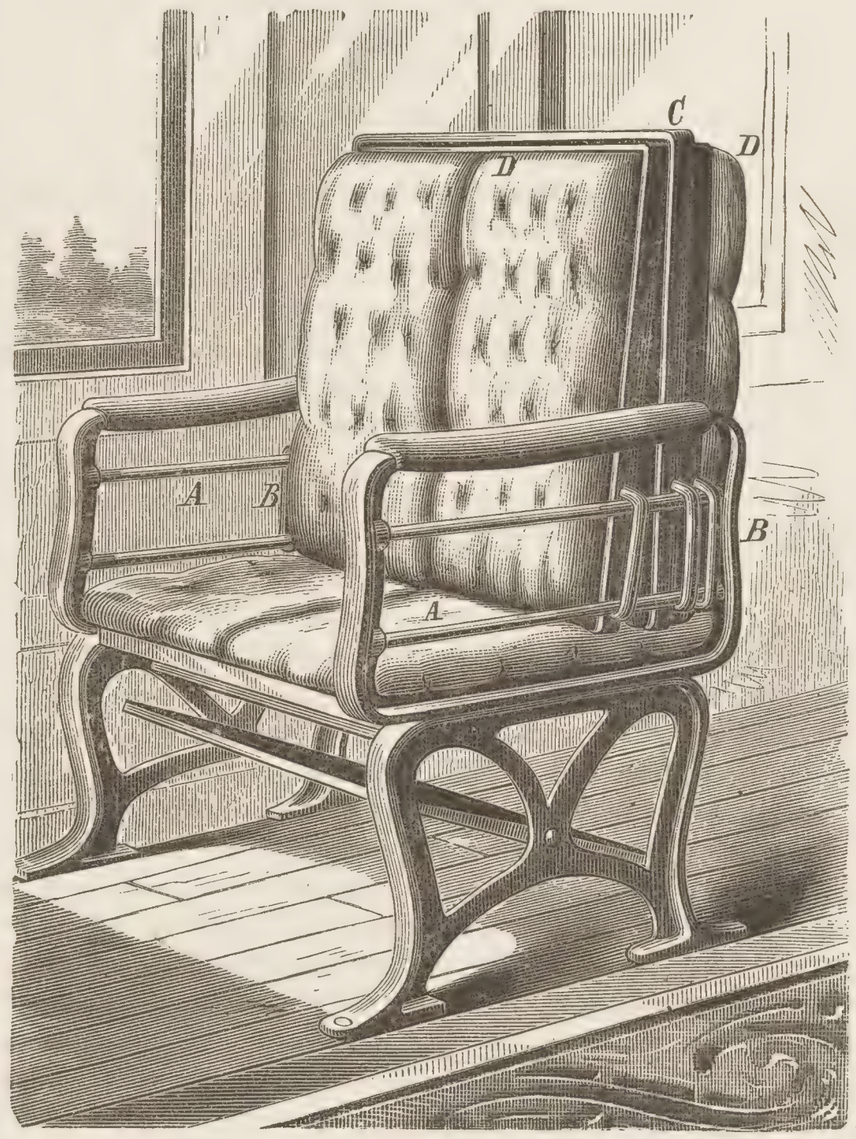
Trial of the Henderson Hydraulic Brake.

A NUMBER of special tests of the capacity of this brake were recently made on the West-Chester and Philadelphia Railroad, the train consisting of a locomotive, one baggage and three passenger-cars, on which the brake had been in use for nine months. At the first trial the train was stopped while going at the rate of 30 miles an hour, on track with a down grade of 15 feet to the mile, in 22 seconds, after running a distance of 870 feet. At the dead stop the steam-gauge pressure was 105 pounds, and the brake-gauge pressure was 90 pounds.

In the second test the brakes were put on when the train was running at 35 miles an hour, and came to a dead stop in 22 seconds, a distance of 720 feet from the point where the brakes were put on. The steam-gauge pressure at the dead stop was 104 pounds, and the break-gauge pressure 95 pounds. The third test was on a down grade of over 30 feet. The train was running at the rate of 30 miles an hour, and was brought to a dead stop in 31 seconds, at a distance of 780 feet. The steam-gauge pressure was 92½ pounds, and the brake-pressure at 90 pounds.

Most of the company then left the train and closely watched the application of the brake. In three tests the train was stopped each time on a level track within from 25 to 50 feet of its own length, in from 16 to 18 seconds. The last test was made with the train going at a speed of over 20 miles, and it was stopped in 18 seconds. The tests were made without reversing the engine, and under several disadvantages. The day was clear, cold, and frosty, and with a slight wind the usual practice of dropping sand on the rail was of no use. Another point was, that through the changing of one of the caps, taken off for the examination of the experts present, it was found necessary to shut off one brake, thus losing one-eighth of the power.

A very noticeable feature of the brake to passengers seated in the car was the fact that there was very little jar and no jerks. The action of the brakes in their application is almost instantaneous. The tests, even under the various disadvantages, were said to be very good. In winter, to prevent the water from freezing, a proportion of glycerine is mixed with it, and this obviates what would otherwise be a great difficulty. The power used is derived directly from the boiler of the locomotive, and is transmitted to pressure-boxes by a hydraulic press operated by a double-acting steam cylinder.



Wellman's Improved Car-Seat.

THE novel feature of the car-seat, represented in the accompanying engraving, consists in the manner in which it is reversed. Instead of turning the back over, as is usually done, arrangements are provided whereby the back is slid from one side of the seat to the other, without being lifted or turned. To this end, fixed rods, A, are provided at the ends of the seat, over which slide the staples, B, which confine the three portions of the back. The latter consists of a centre piece, C, which may be of wood or metal, or both, to the top of which are secured the outer parts, D. These last are each made in two portions, which spring out and in independently. The backs of each part, D, are of wood, and springs or upholstery are inserted between them and the central portion, C, to give further elasticity.

It will readily be understood that the entire back is supported on the staples and rods, and hence, by the sliding of the former over the latter, is readily pushed from front to rear of the seat, or *vice versa*.

Patent pending through the Scientific American Patent Agency. For further particulars address the inventor, Mr. Edwin G. Wellman, Canandaigua, Ontario County, N. Y.

Proposed Railroad Club in New-York.

THE *Railroad Gazette* remarks upon the good results that have attended the recent discussions at the rooms of the Car-Builders' Association in this city, and suggests the idea of extending the system by bringing within its scope subjects pertaining to other departments of railroad economy and operation. "The formation of a railroad club in New-York," says the *Gazette*, "has therefore been proposed, the members to be officers of railroads and proprietors of establishments engaged in the manufacture of material and machinery used by the former. The organization could be extremely simple, consisting only of the ordinary officers of such associations and a committee to arrange for periodical meetings. The club might have rooms of its own in some central location, so as to form a central and convenient place for the transaction of business among its members. A competent person would have charge of the rooms. It would thus be a down-town club, the want of which is much felt by non-residents in New-York who have occasion frequently to visit the city on business. Such an organization would also accomplish the purpose of making different classes of railroad men better acquainted with each other, and if the meetings were skillfully managed, would afford the means of inducing the most experienced and skillful managers in the different departments of railroad operation to present the results of their observation and experience, and of having their views discussed by others with similar knowledge. Such an organization would in no way take the place of any of the existing associations, each of which has a special field of its own, and purposes and methods of working entirely different from that suggested for the 'railroad club.' In London, we are informed, there are a number of clubs, the membership of which is confined to certain professions and occupations."

Steel Rails in France.

AN exchange paper, referring to the character of the steel rails in use in France, says:

"Various forms of rail have been discussed by the Northern Railway of France, specimens of each of which are shown at the exhibition, before they finally chose the light rail of 60 lbs. to the yard. The conditions sought to be fulfilled were, to keep the same height, inclination of the foot, and general convexity of the cap as had hitherto served so well in the original 70 lb. iron rail; and to give as much margin as possible for the gradual abrasion of the head by friction, by reducing the thickness of the stem of the rail to the least dimensions compatible with the requisite stability, and with due regard to the difficulties of manufacture. In theory the strength of the cap should never in any period of its wear be inferior to that of the foot. The present form of rail is constructed to answer these conditions. It attains the theoretic proportions after a wear of .18685 inch; and after a like further amount of wear of .3737 inch, corresponding to a traffic of over 200,000,000 of tons, its resistance will still be greater than the new 70 lb. iron rail. The proportion of the height to the breadth of the base in the section, which is, of course, the measure of the stability of the rail, is in the original iron 70 lb. 25-21 or 1.19; while in the new 60 lb. steel rail the proportion, when new, is 1.288. But it may be remarked that the orthodox proportions of 25 to 21 have been exceeded in several cases, and with no objectionable results, as in the iron rails of the Lyons company, whose proportions are 1.3, and in the railway from Cologne to Minden, where the proportion is as high as 1.356."

THE Philadelphia and Erie Railroad Company intend to lay forty miles of steel rails at different points on each division of the road between Sunbury and Erie during the coming summer. To accomplish this work four thousand tons of rails will be required.

MR. H. ELLIOTT, for many years master mechanic of the Western Division of the Ohio and Mississippi Railway, resigned that position some months since, and is now engaged in the business of manufacturing steel-rail frogs and crossings in East St. Louis.

A COMPANY, with a capital of $50,000, has been lately organized in Rockland, Me., under the name of the Knowlton Platform and Car Coupling Company, for the purpose of manufacturing platform and car couplings.

Comfort vs. Extravagance in Railroad Management.

BY J. M. BLANCHARD.

THERE can be no doubt that the railroad managers of this country are placed in a peculiar position in two respects, at least. First, their patrons are clamorous for high rates of speed and low fares, and secondly, their stock and bond holders are equally clamorous for dividends and interest. The officers of our roads, so far as the writer is acquainted with their views, are desirous of serving both of these parties; and the question which naturally presents itself to their minds is, how can this be done? If passengers and freight are to be moved at high rates of speed, it can not be done at the same prices that it can be at less speed, because the expenses consequent upon moving a train of cars at twenty miles an hour for passengers, and ten for freight, are increased in proportion to the increased rate of speed; and hence it follows that a price per capita for passengers, or a price per ton for freight, that would prove remunerative to stockholders at twenty or ten miles per hour, would fail to pay actual cost at a greatly increased rate of speed. There can be no doubt that if managers were left to consult only the interests of stockholders, they would at once reduce such rates; and so far as clear profits are concerned, there can be no question as to what the result would be; but the moment that such a proposition is made, their patrons step in and say that railroads were chartered for the benefit of the people at large quite as much as for the benefit of stockholders, and hence we must be accommodated on your line by being transported at the highest attainable speed within the limits of safety, or we shall transfer our patronage to some other line; and it is undoubtedly true that in deference to this demand, directors and other managers have yielded, and if they have not increased the speed of trains, they have at least maintained their existing rates, and it is probable that this has been done in violation of their better judgments.

The question arises, Is there no practical remedy for these evils? It must be conceded that railroad officers have the right to manage the properties intrusted to their charge in their own way, subject only to the conditions of their respective charters; but this should not preclude others from giving their views upon the subject. Mere antagonisms between parties can never solve the question to the satisfaction of either; this must be accomplished by some kind of mutual concession.

It is no disparagement of railroad managers to say, that like other business men, they acquire the habit of adhering to certain methods of conducting their business, and these methods are fair subjects of comment. One of these is the practice of closing construction accounts long before the line is completed, or before it is put in fair working condition, and charging the expenses of the erection of buildings and various other things to the operating expenses of the line, as a consequence of which, the cost of transportation is apparently increased beyond what it really is. Another practice is that of expending a large amount of money in the mere adornment of buildings and cars, a thing which in no sense adds to the comfort of their patrons, or to the value of their properties, the cost of which, however, must be made up by an increase of business or of existing rates of charges; and thus the apparent cost of doing a given amount of business is made to appear to be greater than it really is, or is increased beyond what it would be under a more economical system of management. To particularize, let us suppose that a good, safe, and commodious passenger-car can be made for $7000, such car being provided with all the modern conveniences, the seats of the best character, and of the form to give the greatest amount of comfort to the occupant, the interior adornments of the car being such as will not offend the most refined taste. If any thing be added in the form of superb trimmings, costly paintings, mirrors, velvet cushions, and the like, it is clear that an extra price must be charged for a seat in such cars, or the percentage divided among the stockholders must be diminished.

Another and a very common habit of the managers of *our* railroads is that of spending large amounts of money in the excessive ornamentation of depots and other structures, giving them the appearance of art-exhibition buildings rather than the substantial look suited to their practical uses. Another source of heavy expenditure is the construction and furnishing of offices in a style of splendor equal to those of the national government. This helps to swell the construction, equipment, or expense account, and must be paid either by higher rates of transportation or by diminished dividends. All outlays of this description, above what utility and comfort require, are of doubtful expediency.

But if managers are at fault in the cases above alluded to, what shall be said of their patrons who insist, whether advisedly or not, that the roads shall render a kind of service for which they are not adequately remunerated? Rates of speed are demanded for which the prices paid are not sufficient to cover the cost; and the fair inference is that the public are not fully aware of the benefits that the railroads of the country have conferred upon them and are now affording them; and a further inference is that they do not realize the fact that if such roads render a service for which they are not fully paid, they must eventually cease to be operated; the consequence of which to the public would be, that the facilities afforded by them would be lost, and the country would have to return to the primitive methods of travel and transportation of freights. It must be apparent that the questions which are now agitating the public mind in reference to the conduct of our railroads, and which are all comprehended under the name of "Cheap Transportation," are resolvable into two, which are—Is the present system of management the best that can be devised; and do the companies charge more for the service rendered than a just consideration for the interests of the owners of the roads demands, and thus make the tax upon the producers and consumers an onerous and unjustifiable one?

The first of these questions must be answered in the negative, for it is a fact that however existing circumstances may seem to justify such a system, it is manifest that the system itself is far from being a perfect one. The second one, justice to railroad men requires should be answered in the affirmative, as it does not appear that the majority of our roads are able, even with the present rates, to pay their stockholders a dividend after having paid their operating expenses and the interest on their debt; and it is only such prominently located roads as are enabled to secure a large amount of business, that are able to pay any dividends at all, and these in many cases are only enabled to do so by omitting to provide a sinking-fund with which to renew their rails and rolling-stock when necessary. It is true that there is great force in the assertion that roads have been built before there was an actual necessity for them, but this does not detract from the fact that such roads have been of great service to the sections of country through which they pass, while they have as a rule been very unprofitable to the parties who furnished the money to build them; and it clearly does not furnish an argument in favor of their being required to render a service for which they are not fully paid. Unfortunately for railroad managers, and for the country, there is a large class of persons that seem to forget, or at least they ignore the fact, that without the roads of which they complain so loudly, their farms would not be worth cultivating, for the reason that the cost of transportation of their products would be so much increased beyond present rates as to prevent them from realizing any profits at all on them. Much has been said about the utilization of our water courses, and the creation of new ones for the transportation of heavy freights; but it is apparent that when this has been done to its fullest practicable extent, only a small proportion of the producers can be accommodated thereby, and that their principal reliance must be upon railroads, or upon some other system of land-carriage, and hence the necessity that exists for bringing our roads up to the highest standard of excellence possible.

From the foregoing it would seem that there are concessions to be made by both parties to this controversy. First, the railroad companies should concede the fact that a plain farmer living upon the prairies of the Great West, can not afford to pay one cent extra freight upon each bushel of grain shipped to market in order to reimburse such companies for the unnecessary expenditures to which we have alluded. Business men while traveling care less for expensive car adornments than for safety and comfort. To secure the latter they are willing to pay liberally. There is also a large class of travelers to whom time is a matter of vital importance, and who desire to be carried at high rates of speed, and who as a rule are willing to pay for it. Others would prefer a less rate of speed if it could be attended with reduced fares. Both of these classes are deserving of consideration. The person who desires to practice the closest economy of money should not be compelled to travel at a rate of speed which would be most advantageous to the economist of time, and as a consequence be compelled to pay a higher rate of fare than if his wishes with reference to speed were gratified. It is equally plain that the person anxious to save every moment of time, should not be required to travel at a slow rate of speed merely to accommodate his more staid and slow-going neighbor, when he is perfectly willing to pay for a higher rate.

The concession therefore that should be made in these respects is, that trains should be run at different rates of speed, in which different rates of fare proportional to the cost of such rates should be charged; and the same rule should be applied to freights. Should the plan above alluded to be adopted, the economy of railroad management would be largely increased, and it is believed that a sentiment would be created that would compel the public to make the necessary concessions on their part, such concessions consisting in an acknowledgment that the railroad companies were endeavoring to provide the best possible facilities, and at such prices as would be fair to both parties; and as a consequence the antagonisms which now exist would be neutralized, and the country saved from the further agitation of the subject.

Wakeman's Paint-Burner and Blast-Lamp.

THIS apparatus was originally designed for the purpose of removing old paint from vessels in a more expeditious and effective way than by scraping it off by hand, especially where a number of coats have been overlaid upon each other. It can be used, however, to remove paint from almost all surfaces, including cars, buildings, etc., a process which is often necessary in order to apply a fresh coat to the wood.

A brief description will give an idea of the way in which the apparatus works. A quantity of cotton is placed in a chamber in the upper part of the lamp and then saturated with alcohol. The chamber is then closed and an alcohol lamp lighted beneath it. The alcohol in the cotton is converted into vapor, which is conveyed by a tube from the top of the chamber so as to pass directly through or into the flame of the lamp underneath, causing a strong blow-pipe flame to extend horizontally some distance from the lamp. This is used to soften the paint to be removed, the same as by means of an ordinary gas-jet. In shops where gas is not used, or where its employment for this purpose is too expensive, the alcohol blast-lamp is a very great convenience and saves much time and labor. It has of late been much improved in many respects. All danger of fire from upsetting has been obviated, the flame is more effectually shielded from the wind, and can be instantly extinguished by blowing it out or removing the lamp. A single filling will last about an hour, and the ar-

rangement is such that the flame may be directed in various ways as may be required. The cost of the apparatus and the expense of using it are small compared with the work which can be done by it.

The Western Union Telegraph Building.

THIS building, which has just been completed at the corner of Broadway and Dey street, is one of the most substantial and conspicuous structures in the city. The main wall is 140 feet in height, and has 75 feet front. The top of the platform of the roof of the clock-tower is 230 feet above the sidewalk, the centre line of the clock being 184 feet from the street level. The top of the vane on the flagstaff is a little higher than Trinity Church spire. The third floor is occupied by the executive officers of the company, the fourth by the company's counsel and other law firms, the fifth by the general and district superintendents and the auditor's department, and the sixth by the batteries of the company. There are 6000 cells in the main battery, which weigh in all about 100 tons, and there are supplemental batteries weighing 50 tons. This battery-room is immediately below the operating-room, and all the main wires are led into it and through the ceiling to the desks of the operators above. The operating room occupies the entire seventh story. It is 75 feet in width by 150 in depth, and 23 feet in height from floor to ceiling. The peculiar architectural construction of the upper stories leaves this room wholly clear; it is furnished with 87 tables, each fitted for four operators. The eighth story is occupied by the Associated Press, with rooms for the General Agent and the Examining Committee. Although the building is thoroughly fire-proof, 18 tubular wells about 50 feet deep have been sunk in the cellar, and with these is connected a Worthington pump, capable of furnishing 200 gallons of water a minute, and of forcing it beyond the top of the building. The building, with the fixtures and plot of ground, has cost $2,200,000.

Chemical Action of Sea-Water on Boilers.

IN all boilers in which salt water is used, the plates are attacked, and the portion of the iron dissolved is ultimately found in the scale, or the mud, to which it imparts a brick-red tinge. Out of the three principal salts always present in salt water, namely, chloride of sodium, chloride of calcium, and chloride of magnesium, to the former two the deleterious action mentioned is ordinarily attributed. This, however, is an error, since both salts are neither decomposed nor altered at the highest temperatures, and hence they can not be caused to affect the iron through the heat in the generator.

The chloride of magnesium, however, a writer in the *Annales de l'Industrie* points out, decomposes into hydrochloric acid and magnesia. The former in contact with the iron attacks it, forming chloride of iron, which is soluble in water. When the chloride of magnesium is deposited by the salt water on the portions of the boiler, this result takes place; and the chloride of iron, dissolving in combination with the carbonate of lime already in solution, forms chloride of calcium and red oxide of iron, which is found in the scale. It remains, therefore, to find a means of combating this action of chloride of magnesium, in order to preserve marine and other boilers in which sea-water is used.

IT is reported that the Westinghouse Air-Brake Company has purchased the patents owned by the Smith Vacuum-Brake Company.

Thayer's Improved Freight-Car Roof.

THE engravings illustrate an improved framing for freight-car roofs. Fig. 1 is a view of the under side of the roof or top of car, showing the improved construction, consisting of a longitudinal centre-beam and diagonal braces, the ends of which are held in place by castings. The ends of the centre-beam are dovetailed into cast-iron blocks, the forms of which are shown in the detached drawings, *a a*; there are bolted or screwed to the inner sides of the end-plates, preventing the ends of the car from being forced out. In each corner of the roof-frame, is a casting, *c c*, bolted to side and end plates to receive the outer ends of diagonal braces. There are also castings, *b b*, on centre-beam to receive the inner ends of both the corner and central braces as shown. Fig. 2 is an end view of roof. In place of separate braces, rods may be used by making the centre-beam castings so the rods may pass through them. It is claimed that this method of bracing gives additional strength and stiffness to the roof-frame. It is adapted to any style of roof, though specially designed for what is known as the Winslow roof.

The inventor and patentee of this improvement is Mr. James G. Thayer, of Atchison, Kansas, who has for many years had charge of the rolling-stock of the Atchison and Nebraska Railroad. We are informed that a number of cars on this road have been fitted up with the improvement, with very satisfactory results. The expense of attaching it to old or new cars is small, and is more than compensated by the saving in repairs. It keeps the roof square, saves roof-boards, screws, and nails by keeping the siding and posts in place, prevents damage to sills and plates, and loss of grain in transportation, the cost of which in many cases would cover the expense of the improvement. Communications may be addressed to the inventor and patentee as above.

FIG. 1.

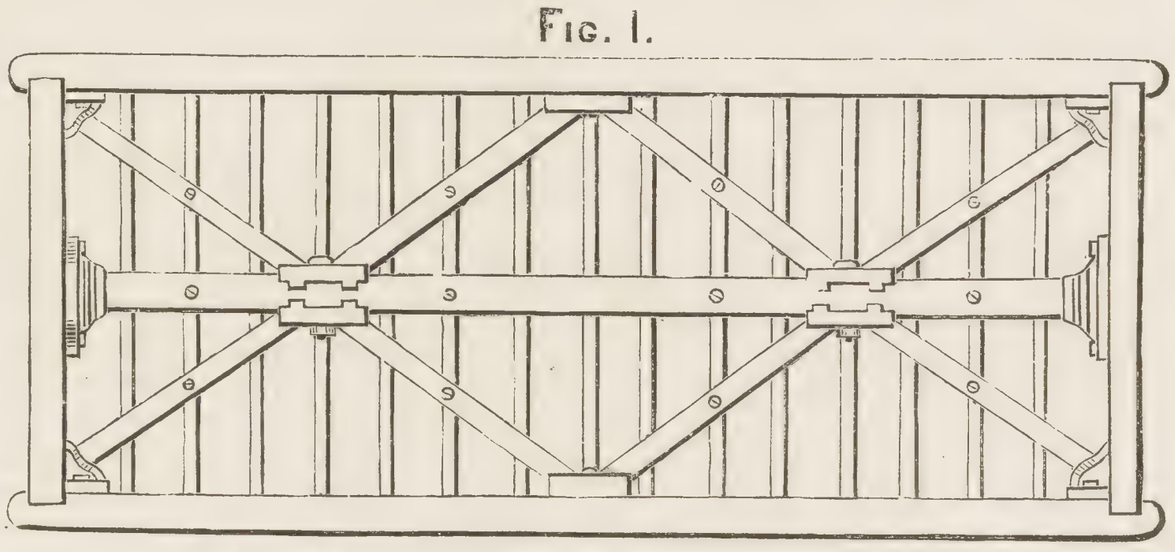
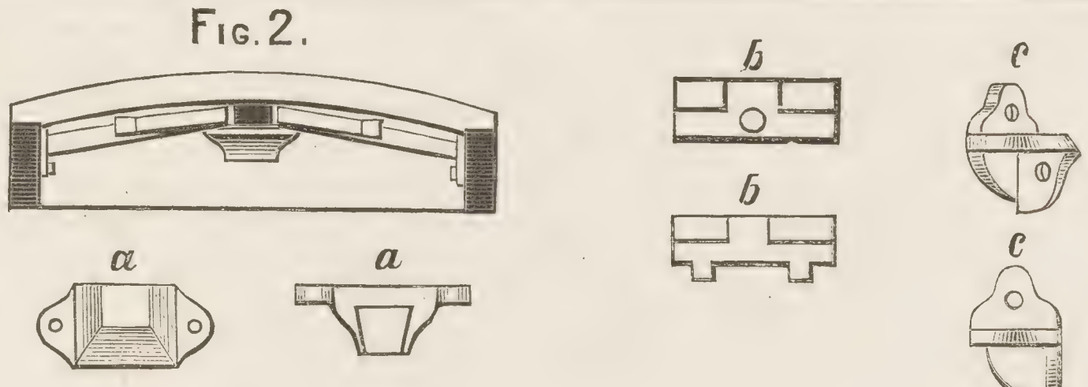


FIG. 2.



Steel vs. Iron Rails.

W. LORENZ, ESQ., Chief Engineer of the Philadelphia and Reading Railroad, in his recent Annual Report to the President, says:

"The gradual substitution of steel rails for iron on the main line and the portions of the laterals most exposed to wear, has reduced the roadway expenses and renewal of rails to such an extent, that whereas in 1873 the removal of railroad iron from the main tracks of the line amounted to 12,504 tons (a considerable reduction from the year 1872), only 7682.5 tons were taken away during the year 1874. The balance of the steel rails laid in 1867, in one of the most trying places in Reading, amounting to 1008 lineal feet, has been removed from the main track and placed in sidings, after having done service for nearly seven years; whereas the life of an iron rail at the same place never exceeded four months. During the past year there has been substituted 13 miles of steel-rail track for iron track, so that the company is now using steel rails equivalent to 92 miles of track. Of the 92 miles of steel track in use last year, a little less than two tenths miles have been removed, or less than one quarter of one per cent. Such an exhibit shows the great superiority of steel over iron rails. Nearly all of the steel-headed rails laid previous to 1873 have been removed from the track—experience having shown that this description of compound steel and iron rails is utterly unfitted to withstand the wear of a heavy traffic."

MR. ANDREW WILSON has retired from the position of master mechanic of the Detroit and Milwaukee Railroad. A complimentary banquet was tendered him on the occasion by the employees of the locomotive and car departments, at Detroit. One of the shops was elaborately decorated, and lighted with two locomotive head-lights. The bill of fare embraced all the luxuries and substantials of the season. Mr. Charles M. Hanson, the new master mechanic, presided. The principal event of the evening was the presentation to Mr. Wilson of a massive gold guard-chain and locket, appropriately inscribed, and also an elegant cluster diamond ring for his wife. The presentation address, which was read by Mr. John Green, paid a graceful tribute to Mr. Wilson's manly worth and mechanical, skill and gave him ample assurance of the high esteem in which he was held by his former employees. Mr. Wilson, although completely taken by surprise, returned his thanks in a neat little speech, in which he complimented the men for the hearty good-will and unanimity with which they had aided him in his efforts to advance the interests of the company. He also referred to his successor in terms of warm praise. The presentation was followed by songs, toasts, and impromptu speeches, and the remainder of the evening was spent very pleasantly. The affair not only demonstrated Mr. Wilson's great personal popularity among the employees, but tended to promote a spirit of good-fellowship among the men themselves.

WILLIAM H. MCKENZIE, late foreman of the Central Pacific Railroad round-house at Sacramento, Cal., has assumed the duties of master mechanic of the Salt Lake division. He is much esteemed as a genial gentleman and an excellent mechanic.

JOHN STEPHENSON & CO., the well-known builders of city street-cars, recently won a suit in the United States Circuit Court, at Albany, in which $100,000 damages were awarded, being the whole amount claimed. The suit was brought against J. M. Jones & Co., car-builders of Troy, N.Y., to sustain the plaintiffs' rights in eleven patents used on horse-cars made by the defendants.

THE following is said to be a very effective method of welding steel to iron: The two surfaces to be welded are slightly wetted, and powdered with a mixture of one part of dried borax, one part of fine iron filings, and one quarter part of prussiate of potash. The pieces of iron and steel are then tightly bound together, either with iron wire or by other means, when all that remains to be done to obtain a perfect weld is to heat them to a temperature of from 350 to 400 degrees, and subject them to blows from a steam hammer, or pass them between rolls.

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Editorial Announcements.

Correspondence.—*We cordially invite the co-operation of the railroad public in affording us the material for a good mechanical paper. Articles relating to rolling-stock and machinery, by those practically acquainted with those subjects, will be gratefully received. All communications must be addressed to Vose, Dinsmore & Co., No. 32 Warren Street.*

Advertising Rates.—*For one square, or one fifth of a column, $5 per month, or $50 a year. For half a square, $3 per month, or $25 a year. Larger advertisements by special contract.*

All communications in regard to advertising should be addressed to L. F. Dinsmore, *Post-Office Box* 4055, *New-York City, who is our agent for advertising, and authorized to make contracts, collections, etc.*

Engravings and Illustrations.

We would invite the attention of Master Car-Builders and others to the advantages to be derived from publishing in The National Car-Builder *engravings designed to illustrate the various features and details of car construction, and especially such improvements as can not otherwise be clearly presented. We will procure cuts to be made in the best manner from drawings or models that may be sent us, and charge only for the cost of engraving, inserting the same in our paper with suitable descriptive details, without charge.*

A Glance at the Situation.

Is there to be a revival of the dormant industries of the country during the present year, or are they to drag along as they have done for twelve months past? This query will be answered in a hopeful or despondent way according to the point of view from which the problem is regarded. Very much, it seems to us, will depend upon the extent to which unemployed capital is attracted toward railway enterprises. The sudden stoppage a little more than a year ago of nearly all new construction after a period of unexampled activity, and the discredit of railway securities which ensued, produced a shock which alarmed the financial world, undermined confidence, and arrested the flow of capital from its accustomed sources. It is futile to expect any improvement so long as there is distrust arising from defaults and rumors of foreclosures and sales under the hammer. These are perhaps unavoidable under the circumstances; yet the transfers to new owners by forced sales may prove in the end to be the most effective means of restoring to railroads their former prestige, and make them once more attractive and paying investments. Many well-located roads are incomplete, and can not do the business legitimately within their reach for want of the necessary equipment, terminal facilities, and other working requisites. They can not borrow the needed capital to make their past outlays available, and also secure the advantages of a prospective development of traffic along their lines. Their creditors refuse to make further contributions, and desperately resolve to pocket their losses by selling the property to the highest bidder. The buyers in such case are apt to drive a good bargain, and come into possession with an ample margin of profit and a greatly reduced capital account, ready for a good start when the tide turns.

There are also some roads that should never have been projected, much less built, in whole or in part—visionary and speculative enterprises, starting from nowhere and terminating at any point where the funds gave out. If sold under the hammer, at whatever sacrifice, they would prove as much of a dead weight to the buyers as they were to the original owners. They are the diseased members of the system, and when lopped off, the better class of roads are the gainers. Skillful surgery, as well as careful nursing, is necessary to restore the old relations between railroads and capital. The holders of stock and bond securities will in future require some rational assurance of honestly earned interest and dividends; there must be more conservative and less profligate management; fewer inside rings and kindred devices for absorbing resources and earnings. This may seem somewhat rigorous and exacting, but there is evidently no help for it. It will not do to assume that railroad property is to become permanently unproductive, and so repel capital instead of attracting it. The system is too gigantic, too intimately interwoven with the structure and very existence of modern society; it is too great a consumer of the products of labor, and too indispensable to every branch and ramification of industry to be classed among the bubbles that float for a time and then disappear. A railroad, once constructed, is a fixture, so far at least as grading, bridging, tunneling, etc., are concerned, and the capital represented thereby is anchored sure and fast for better or worse.

Now it seems to us that capitalists, as soon as their intelligence begins to get the better of their caution, will see the situation in its proper light; and recognizing the fact that railroads are certain to be constructed and used wherever the need exists, a right discrimination will be made between those which, from their location and management, promise to be ultimately remunerative and those which do not. It must be easy to see how largely dependent are manufacturing and other enterprises upon the prosperity of railroads, and that to withhold encouragement from the latter is to diminish the chances for the profitable employment of capital in most other directions. Indeed, it is safe to say that if railroads are to be kept under ban another year by hostile legislation, and distrust on the part of those who have hitherto most profited by them, the excessive supply of capital and labor will be such as to create a very anomalous condition of things—a kind of dead-lock very difficult to deal with.

The fact that nearly 2000 miles of new road have been built during the past year is a hopeful augury of the future. Much of this mileage consists of narrow-gauge and other roads of merely local importance, such as feeders and completed connections; but they have evidently not been built with money borrowed on call. The bulk of the work that is likely to be done in the near future, will be the completion of unfinished lines, the supplying of missing links, and the making of such repairs as will render past expenditures remunerative. In many localities, years must elapse before the traffic will be equal to the provision already made for it, while there is elsewhere need of still greater facilities than now exist. The low prices of material and labor afford an opportunity for constructing roads cheaply, a circumstance which is not likely to be overlooked by capitalists who desire to change a dead or dubious investment into a profitable one. The renewals of rails and rolling-stock have for a year and a half been restricted to the smallest practicable limit, and further and heavier purchases can not much longer be deferred. This we know is a threadbare argument, but it is a good one; for we maintain that any improvement in the present condition of things must begin where the crash began; that is, with the railroads, which are the basis and mainspring of our industrial prosperity and progress. They must also be sustained by a more tolerant and liberal attitude on the part of capitalists, and this again must be met by a more conservative and economical management of the roads. In this way, and in no other, will the machinery of trade be set in motion, and the vast capital invested in our iron manufactories be vitalized and made productive. General business, if no disturbing element is interposed by unwise legislation, will slowly recuperate, and the exchanges of products will increase the earnings and improve the financial condition of the roads generally.

Economy in Car Decoration.

During the prosperous years which preceded the present period of stagnation, a great many costly and elegant passenger-cars were built. In order to render them attractive to the public and creditable to the taste and enterprise of the builders, they were decorated with the choicest cabinet-work and every ornamental accessory calculated to heighten the effect and satisfy the most fastidious. If this part of the business was a little overdone and the expenditure in this direction somewhat lavish, the fault is due to a natural rivalry among the roads as well a pampered craving for an excess of finery on the part of the public. This tendency is now considerably abated, so that very little new work is projected without a careful cutting down of every thing in the way of superfluous expense. More inexpensive styles of finish are coming into vogue, and, considering the stress of the times, this is all very proper, and can easily be put in practice as respects new construction. With respect to old cars, however, the case is somewhat different, for the reason that many of these were finished with rare fancy woods and costly veneers that have become impaired by service. Varnishing will do something towards restoration, but can not quite bring back the original freshness and beauty of the material. It still has a faded, furbished-up look after the most skillful treatment. In cases where restoration is out of the question, the whole inside is painted in plain color, and if carefully and skillfully done the effect is very good, although by no means artistic in the usual sense of the term.

In decorative art, we are opposed on principle to any compromise with shams. Once accustomed to what is honest and real, it is hard to become reconciled to trickery and imitation. Painted surfaces are not, however, necessarily deceptive. Whitewash on a wall or fence is a cheap device, but it does not offend because it is always taken to be what it is. There is no deception about it. The same may be said of paint, so long as it does not pretend to be something else. We can therefore see no objection to its use as an economical substitute for more costly cabinet-work in the inside finishing of cars. It is a mute but frank confession that the times are hard, and that the garment must needs be cut according to the cloth. The transition, however, from rosewood and mahogany to plain paint is a violent one, although it may accord with some of the prevailing notions of economy in first cost. The only intermediate resource is graining, which, if skillfully done, is much more agreeable to the eye than barren wastes of plain colored surfaces, put on as they are apt to be without much regard to harmony and adaptation. Graining, however, is imitation, and as such is intrinsically mean. If it *must* be used, care should be taken to make the imitation as perfect as possible. With the requisite skill, almost any wood can be imitated so well as to be mistaken for real by ordinary observers. The highest perfection requires much experience, a dextrous use of graining tools, a trained eye, and great judgment in mixing the color so as to produce the delicate and subtle gradations and blendings of tints peculiar to the natural grain. The prepared graining-colors sold by dealers, are some of them admirable imitations of the tints of different woods—light and dark oaks, French and American walnut, maple

mahogany, etc. This is a great boon to the grainer' who may be very expert in reproducing or copying the patterns peculiar to different kinds of wood, but for the want of the exact corresponding shades of color, his work may be no more like the natural wood than cherry is like walnut. In this connection we may mention that some time ago an improved method of graining was exhibited at the rooms of the Car-Builders' Association, by which the actual grain of any given piece of wood is transferred with perfect fidelity to the receiving surface by a simple mechanical process like ordinary printing. It received apparently but little attention at the time from car-builders, as fancy woods were all the rage for car-finishing. The art of graining has of late years fallen into comparative neglect, and but few people are aware of the perfection to which it may be carried with the improved colors and devices for applying them. This method of car-ornamentation seems likely to have a temporary revival until railroad business recovers its wonted tone. For cheap coaches and old work where the natural woods have become discolored and faded beyond repair, it may be rendered very serviceable and economical, while it is superior to any other kind of imitation yet discovered.

We do not imagine, however, there is to be any thing more than a temporary check to the construction of palatial passenger-coaches. The cloud which rests upon railroad prosperity, and the spasm of economy now prevailing, will not always last, nor will the great traveling community be willing to forego the luxuries heretofore enjoyed. The fashionable church congregations of the period would as soon give up their costly and highly adorned places of worship and go back to the grim and forbidding structures of a hundred years ago. The palace-car is one of the distinctive features of the age, and can no more be dispensed with than first-class hotels, steamers, and a variety of other things that minister to our pleasure and comfort, but which would have been regarded in Puritanic times as demoralizing luxuries.

The Freight Competition.

If business of all kinds is slack and drooping, it can hardly be due to obstructions in the shape of exorbitant rates of freight interposed by the remorseless combinations of railroads. The theory that the railway carrying-trade is a monopoly exempt from the wholesome restraints of competition is practically exploded, at least for the time being. Never before were east and west rates so near a vanishing-point, and never before did shippers have the carriers so much at a disadvantage. Ordinarily, competition is the life of trade, but this familiar truism has no application to the existing freight war, except in a negative sort of way. There is life—apparently a good deal of it—among the competitors, but it resembles the vitality exhibited by famished men when the rations are too short to sustain existence, even if they were fairly distributed. Under such circumstances, self-preservation is very apt to be recognized as the paramount law, and any combinations to keep prices above the level fixed by the relations of supply and demand are as futile as to attempt to regulate the tides by an edict of authority. As a rule, low freights are a great advantage to shippers and consumers, because they tend to reduce the prices of commodities in a corresponding ratio; but it is more than questionable whether the present ruinous rates are of any real advantage to any body. They certainly are not to the carriers, or the stock and bond holders they represent, who get no more to carry than if rates were higher, because shippers ship no more than their business requires, and this much they would be likely to do any how. If the rates would not justify the business, they would make the business justify the rates. Besides, business men know that the present rates are unreasonably low; that they do not increase the traffic of the roads; that they are less than the actual cost of transportation, and that they can not be sustained. They fear a reaction—the result of new combinations—which may be a violent one, sufficient to compensate for the losses under present rates; and this deranges all calculations and estimates for the future, and is so far a drawback and detriment to legitimate trade.

The Size and Framing of Cars.

Our readers will bear in mind that the subject for discussion at the car-builders' monthly meeting, on the 18th of the present month, is the size and framing of freight and passenger cars. This is one of the most important subjects that is likely to come before the next annual meeting, and all the preliminary attention that can be given it by members of the Association, and especially by the committee having it in charge, will be time profitably employed. As a matter of economy and necessity, there is an increasing tendency to greater uniformity in the patterns and dimensions of freight-cars, as well as in every important detail of their construction. It is evident that such uniformity can never be fully realized until something like a standard pattern for each of the leading classes of freight-cars now in use is constructed, approved, and recognized as such. To accomplish this, even so far as concerns the ordinary box or merchandise car, will require a good deal of hard thinking, experimenting, and earnest co-operation. It will never be done by mere desultory, aimless talk, or getting up hastily prepared reports which compel a postponement of the subject from year to year, simply because the manifold difficulties of the problem are not grappled with. By reference to the committee's circular in another column, it will be seen that the idea of a "National" car is somewhat timidly broached, and also a plan foreshadowed by which such a consummation may possibly be realized. We think the idea is a good one, and trust it will not be permitted to languish and die out.

The Philadelphia and Reading Railroad has 15,073 coal-cars. Of these, 7762 are 8-wheeled wooden cars, 5434 are 4-wheeled wooden cars, 1874 are 4-wheeled iron cars, and 3 are 8-wheeled iron cars. The road has also 3819 freight-cars of all kinds, and 279 8-wheeled passenger-train cars, including mail and baggage. No additions to the passenger equipment have been made during the past year, except ten new cars to replace a like number which were unfit for further service. During the past season the company has frequently been pressed to meet the demand for passenger transportation, and this, with the prospect of increased travel this year and during the Centennial Exhibition, has caused the General Superintendent to recommend that this branch of the company's equipment be materially increased.

At the annual meeting of the stockholders of the United States Rolling-Stock Company, on the 4th ult., 19,396 shares of stock were voted upon. James B. Hodgskin, Adrian Iselin, William H. Guion, Lawrence Wells, and Parker Handy were unanimously elected trustees for the ensuing year. The trustees at a subsequent meeting re-elected James B. Hodgskin, President; Wm. H. Guion, Vice-President; A. Hegewisch, Secretary and Treasurer; C. F. Jauriet, General Master Machanic.

It is worthy of note that the depression of prices for labor and materials is telling strongly in favor of those new railway enterprises which are fortunate enough to command the means for construction. An illustration is furnished by the low bids made to the Cincinnati Southern for the rails they propose to use, and also by the statement that some time ago the same organization made a contract for the Ohio River bridge for a sum but little over half the former cost of such a structure.

Improved Railway Axle-Boxes.

Mr. C. A. Hussey, of this city, has patented an improved plan to prevent dust and sand from getting into railway axle-boxes. This is accomplished by means of leather packing, arranged to form a tight connection from the box against the wheel, so that the lubricating fluid may be poured into the box, to allow the journal to run in oil. The invention does away with the old dust-plate and the cotton waste packed in beneath the journal. The axle-box is made shorter, smaller, and consequently lighter and cheaper than the common box, while it accomplishes the object in the most perfect manner, that is, the complete lubrication of the journal and its consequent protection from heating and wearing. Mr. Hussey has also another invention, which is an improved method of preserving the journals and brasses of railroad axle-bearings from heating and wearing. This is accomplished by producing a circulation of water or other liquid through the brass or box, which receives all the friction of the journal. The brass of the axle is chambered out in any suitable manner, and elastic tubes are connected therewith for conducting and discharging the water to and from the brass. A lively current of water is produced from an elevated reservoir, which keeps the brass and journal at a low temperature. The ordinary absorbent (cotton waste) may be used in axle-boxes having this cooling current applied to the brasses, with safety from heating and wearing.

"The Catechism of the Locomotive."

This work, which was published in successive numbers of the *Railroad Gazette* during the past year, is now issued in book form, and constitutes one of the most comprehensive and valuable hand-book treatises on the theory, construction, and operation of the locomotive engine that has yet appeared. The author, Mr. M. N. Forney, is peculiarly qualified, by his intimate knowledge of the subject and experience as a mechanical engineer, to produce a work suited to popular demand, and especially to the daily needs of locomotive runners, firemen, and machinists. It is written, as its title indicates, in the form of question and answer. This, aside from its lucid arrangement and fullness of detail, will render it more instructive as well as more attractive to a large class of readers than if written in the usual style of technical treatises. The descriptions and explanations are not marred by an excess of terms intelligible only to mechanical and scientific experts, but can be understood by any one with a partial knowledge, or even with no previous knowledge at all, of the construction and working of locomotives. Special attention is given to the peculiarities of modern American practice, and to the latest scientific discoveries relating to combustion, heat, etc. The volume contains 625 pages. It is printed in large type and embellished with 250 engravings illustrating all essential parts of the engine. At the end is a copious index by which reference can readily be made to any particular detail or topic embraced in the work.

The book will be sent by mail for $2.50, postage paid. Address *Railroad Gazette*, 73 Broadway, New-York.

We omitted to say in our last issue that there would be no monthly meeting for February at the Car-Builders' Rooms.

The Pullman Palace-Car Company are making, at their shops in Detroit, eleven palace-cars to go to England and nine to go to Italy.

The completion of the Canada Southern Railway to Chicago has been determined on. The road will be in almost a straight line from Buffalo to Chicago.

The Baldwin Locomotive Works are executing an order from Brazil for sixteen first-class locomotives, and Western South-America has ordered six that are now under way.

Miscellaneous Items.

ONE thousand tons of Welsh rails are reported to have been sold at New-Orleans at $50 per ton.

A MASSACHUSETTS health agent is going through the smoking-cars on the different railroads, with a bellows and bottles, collecting samples of the atmosphere in each car for future analysis.

THE Board of Direction of the American Institute has awarded the great gold medal of progress to Professor R. H. Thurston, of the Stevens Institute of Technology, for his autographic testing machine.

THE Lake Shore and Tuscarawas Valley Railroad has been sold to Selah Chamberlain, of Cleveland, for one million of dollars, and its name changed to The Cleveland, Tuscarawas Valley, and Wheeling Railroad.

THE offices of the Eastern agency of the Chicago and Northwestern Railway have been removed to 415 Broadway. They are in charge of Mr. L. F. Booth, general Eastern agent, and have been fitted up in elegant and convenient style.

NEGOTIATIONS have about been completed between the United States Rolling-Stock Company and Barney & Smith Manufacturing Company, of Dayton, to have all the cars of the former company now used by the Atlantic and Great Western Railway, changed from broad gauge to standard gauge.

RECENT trials by Wood, Bishop & Co., and the Bangor Foundry and Machine Company, prove the No. 1 iron made at the Katahdin blast-furnace, in Maine, to be fully equal, if not superior, to the best imported Scotch iron for stove and hollow-ware purposes. There are other brands of iron that are just as good as Scotch for these purposes.

AMONG several engines turned out at Blood's Locomotive Works, in Manchester, N. H., in December, were five for the Boston and Maine Railway, which included a heavy one for freighting, called the "Saw," with cylinders seventeen inches in diameter and a twenty-four inch stroke, with drive-wheels five feet in diameter, and with a total weight of thirty-five tons.

THE Chicago *Railway Review* says: "We are informed by the leading iron manufacturers and dealers in this city that there is a very large amount of inquiry for steel rails, and that the prospect of a good spring business is excellent, in fact, never better. A large number of companies will, according to present appearances, take advantage of the low prices to relay tracks with steel rails."

NOTICE is given that the Chicago, Rock Island, and Pacific Company will charge one cent per mile, loaded or empty, for the use of their cars, and the same will be paid to other roads and lines. The price heretofore has been 1½ cents per mile. This reduction in the rate for car mileage seems to be general, and probably has been or will shortly be made by all the leading companies of Illinois.

THE Dickson Manufacturing Company, locomotive and car-builders and general machinists, have two establishments, one at Scranton and the other at Wilkesbarre. They have in their employ over 1500 hands, and the pay-roll amounts to over $50,000 per month. The works have been kept in operation, not only through the present times of depression, but also through the panic of 1857.

OF three recent disastrous accidents on English roads, the worst was occasioned by a broken car-wheel on a train going 35 miles an hour, by which several cars were thrown down an embankment into a canal; whereupon the Springfield *Republican* says that if American cars are heavier to transport, they are certainly not as dangerous as these little English vehicles on four wheels which are knocked about like a child's blocks.

SAYS the San Francisco *Scientific Press*: "Manufacturing of every description is flourishing in this city and State as never before. The mills, the boot and shoe manufactories, and manufactories of case goods, and, in fact, every description of industrial enterprises are increasing their number of employees. The increase in this direction in this city during the past year has been over 1000 hands. We are just entering upon a new year with most extraordinary evidences of prosperity."

THE Richmond, Fredericksburg, and Potomac Railroad is build two veryhandsome parlor-cars. The inside finish is bird's-eye and curled maple, ash and cherry, with walnut mouldings. A new feature of the inside work is the veneering of that portion of the ceiling between the side-walls and dome-lights with curled maple. Red cedar is used for the seat-frames, to protect the upholstering from moths. W. H. Trainham is the master car-builder.

THE new cattle-yards of the New-York Central and Hudson River Railroad extend from Sixtieth to Sixty-fifth street, and from Eleventh Avenue to the river. They are paved throughout with Belgian block-stone, and well drained, and in other ways adapted to promote the convenience of dealers, and the proper care of the animals. They are a part of the extensive terminal facilities which the road is furnishing, and contain accommodations for four thousand head of cattle. Stables and sheep-sheds are to be added as soon as possible.

THE Pennsylvania Railroad Company is about to introduce a telegraphic arrangement for wrecking cars which can not fail to prove of great convenience and benefit. It consists of a small table with a sloping cover upon which the instrument will be placed. Beneath the table is a reel of cable-wire, and upon the cover a patent clamp for severing and making connections. Each wrecking-car will be supplied with the improvement, and connections may be made and communications opened in five minutes after arriving at any point upon the road.

THE Turkish Government has begun the construction of a railway, to be called the Steam Caravan, between Alexandretta and Alleppo, Syria, 94.2 miles. A single rail is employed, following the conformation of the land, but raised on a wall 28 inches high and 17.5 inches broad. The vehicles are mounted and straddle both rail and wall. The locomotives are provided with horizontal, leather-covered wheels, which rest against the sides of the masonry and serve as brakes, and the last vehicle of each train has similar arrangements. Each side of each carriage will hold two persons, and the complete train will accommodate ninety-six.

THE Cincinnati Southern bridge, to be built over the Ohio River, is to be in all 1596½ feet in length, and a wrought-iron truss bridge throughout. Starting from the Kentucky shore, there is first a fixed span of 110 feet, then a draw span 367½ feet, then the channel span 519 feet, and last, two fixed spans of 300 feet each. The channel span will be 106 feet above low-water mark, and 43¼ above the high-water mark of 1832. The approach on the Kentucky side will be an earth embankment, and on the Ohio side an iron trestle.

THE St. Louis Car-Wheel Company has lately purchased the royalty of Sax & Kear's patent steel tire, to be used on car-wheels, and have made a practical test of welding the tire on the iron flange of the wheel. The operation was performed in the presence of several railroad mechanics and others interested, and was an entire success. The wheel, when covered with this steel tire, will endure about 125,000 miles of travel, or about three times as much as the ordinary chilled iron wheel.

IT is said that the first patent issued by the United States was granted to Samuel Hopkins on July 30, 1790, for the manufacture of pot and pearl ashes. The third was to Oliver Evans, of Philadelphia, so famous for inventions in high-pressure engines, of whose invention President Jefferson remarked that "it was too valuable to be covered by a patent, and there should be no patent for a thing no one could afford to do without after it was known." This was in December of the same year in which Hopkins obtained his patent. For many years after this date the Patent-Office was but a clerkship in the State Department.

THE New-York and Philadelphia line is making progress, and it is stated that there is now no doubt of its early completion. Grading began in October, and progressed rapidly till the very cold weather; and work is going forward on the piers of the bridge across the Delaware at Yardleysville, which will be ready for the superstructure early next summer. On the New-Jersey side the only portion to be built is from Bound Brook to the river, and for the whole distance the road is located upon the old National Air-Line Road, advantage being taken of the grading done several years ago. From Bound Brook to New-York the line will be that of the Central Road of New-Jersey.

TO remove stains from marble, take two parts of common soda, one part of pumice-stone, and one of finely-powdered chalk; sift it through a fine sieve, and mix it with water; then rub it well over the marble, and the stains will be removed. Wash the marble afterward with soap and water.

SULPHUR in well or spring water may be detected by saturating a slip of paper with sugar of lead, and exposing it for a short time near the surface of the water. If the paper is discolored, it shows the presence of sulphuretted hydrogen. Another method is to take a small quantity of the water, into which pour a small quantity of a strong solution of sugar of lead; the darkening of the water is proof of the presence of sulphuretted hydrogen.

MUCH trouble can often be saved by marking tools with their owner's name. This can be done by coating the tools with a thin layer of wax or hard tallow, by first warming the steel and rubbing on the wax warm, until it flows, and let it cool. When hard, mark your name through the wax with a graver and apply aqua-fortis (nitric acid); after a few moments wash off the acid thoroughly with water, warm the metal enough to melt the wax, and wipe it off with a soft rag. The letters will be found etched into the steel

Extraordinary Welding.

THERE has lately been shown a very interesting specimen of blacksmith work—a bar of Bessemer steel, to which five different kinds of iron and steel have been perfectly welded, without changing its shape in the least. The bar was rolled into form at Thompson's steel works in Jersey City, and is ½ by 2½ inches in the cross section. The welds were all made with Schierloh's welding compound.

First, a piece of Bessemer steel, cut from the end of the bar, was welded fast to it again, the heating and welding occupying eight minutes. On the reverse side of the bar a piece of fine cast-steel was welded in six minutes. Further along on the bar, a piece of blister steel was welded in eight minutes. This same steel can not be welded with borax, as the high temperature needed with the flux makes it as brittle as cast-iron under the hammer. Opposite this a piece of wrought-iron was welded in six minutes, and further along on the bar a piece of cast-iron was welded in three minutes. This was a piece of the mould-board of a plow. The bar, with its additions, was then ground and polished on the edge, so as to show the points at which the welded metals came into contact. No weld was visible on any one of them, and the difference in the metal could only be told by the color after polishing. This solves a great many important problems in iron manufacture, among others the welding of Bessemer scrap, the rerolling of Bessemer rails, and the manufacture of iron rails with heads.—*American Manufacturer.*

Committee Circulars of Master Car-Builders' Association.

THE following circulars have been issued by the committees of this Association:

JOURNALS, BEARINGS, LUBRICATING OILS, AND PACKING MATERIAL.

To the Members of the Master Car-Builders' Association and others having charge of Passenger and Freight Cars:

GENTLEMEN: The undersigned, appointed at Cincinnati, June 10th, 1874, by the Master Car-Builders' Association, as a Committee to report at the Annual Convention to be held June 9th, 1875, in New-York, upon the *Best Remedy for Hot Journals; their Treatment; the Best Metals for Bearings; the Best Lubricating Oil and Packing Material,* would respectfully submit for your consideration the following questions for the purpose of eliciting information on which to base their report. It is to be hoped that your interest in this subject will insure a full and early reply.

1st.—Are you troubled with Hot Journals on your road? If so, what is the general cause, and what remedy do you apply, and its success?

2d.—What in your judgment is the best material to use in Packing Boxes; also the kind of oil used as a Lubricator, and does it answer the same purpose in summer and winter?

3d.—What metals or combination of metals do you find to be *best* for Journal Bearings—taking into account liability of heating, and durability of Journal and Bearing? What *form* of Journal Bearing do you think will give the best results?

All information bearing upon the above will be thankfully received. Address replies to Chairman, giving name of road.

J. W. HOLMES, Chairman,
Atlantic and Great Western R.R., Galion, Ohio.
J. D. MCILWAIN,
Lake Shore and Tuscarawas Valley R.R., Black River, Ohio.
A. STEINBRUNNER,
Cleveland and Pittsburg R.R., Cleveland, Ohio.
Committee.

THE BEST STYLE OF FREIGHT-CAR TRUCKS.

To the Members of the Master Car-Builders' Association and others having charge of Passenger and Freight-Cars:

GENTLEMEN:—The undersigned were appointed, at the Annual Meeting of the Association held in Cincinnati in June last, a committee to report to the next Annual Meeting, on the *Best Style and Most Economical Truck for Freight-Cars; Best Position and Hanging of Brakes, and Position of Brake-Shaft (right and left hand) when standing on Car.*

In order to obtain such information as will enable the Committee to make a report that will be valuable and interesting, the following interrogatories have been prepared, and are sent out with the earnest request that the replies to the same be made to the Chairman as fully and as promptly as possible. The great importance of the subject of Freight-Car Trucks, and of ascertaining the best methods of construction, render it necessary that the answers to these questions should be full, clear, and explicit, and embody as much of detail and the results of experience and observation as practicable. It is also desirable that such answers be accompanied with Tracings or Drawings, showing the construction of such Trucks as may be considered the best, with all essential particulars of cost, weight, etc.

The time of the next meeting (June 9, 1875) being so near, it is important that this circular should receive immediate attention; and in order to relieve the Committee from expense and embarrassment, parties receiving it will confer a favor by notifying the Chairman whether he may expect a reply, and how soon.

1st.—Do you consider an iron or wood frame truck the best? and what are your principal reasons for preferring one or the other?

2d.—Is a truck with swinging-bolsters, in your judgment, preferable to one with a rigid frame? and if so, or not, please state your reasons.

3d.—Can a locomotive, under all circumstances, start and draw more cars with swinging-bolster trucks than with rigid frame trucks? If you use swinging-bolsters, please send drawings showing position of hangers, and also state your opinion of the merits of such trucks.

4th.—Should the side-bearings take any portion of the weight, and if so, how much?

5th.—What kind of side-bearings do you consider the best?

6th.—Would you recommend for either iron or wood frame trucks, a short spring in the jaw over the boxes?

7th.—Do you have any difficulty in keeping iron-frame trucks square? Do you brace such trucks, and if so, in what manner, and with what results?

8th.—What distance from centre to centre of axles would you recommend as the best?

9th.—Is a centre-bearing truck, in your judgment, easier on the track and wheels than it would be with a portion of the weight on the side-bearings?

10th.—How much leverage should be allowed on the brake-levers to secure efficient braking and the preservation of wheels?

11th.—Should freight-cars have brakes upon both trucks? and should such brakes be placed outside of the wheels or between them?

12th.—Are your brakes so constructed and applied as to give a uniform or equal pressure upon each wheel? If so, please send description and tracing of such brakes?

13th.—Which do you consider the best plan of hanging brakes, to body of car or to truck-frame?

14th.—Which, in your judgment, is the best position for the brake-shaft? Should it be on the right or left hand corner of the car as you stand facing the car?

15th.—Would you, with the consent of your superior officers, favor the idea of a *National or Standard Freight Car Truck,* duplicate in all its parts except wheels and springs?

D. HOIT, Chairman,
New-York Central and Hudson River R.R., West Albany, N. Y.
JOHN KIRBY,
Lake Shore and Michigan Southern R.R., Cleveland, Ohio.
W. F. SMITH,
Cleveland, Columbus, Cincinnati and Indianapolis R.R., Cleveland, Ohio.

THE SIZE AND FRAMING OF PASSENGER AND FREIGHT CARS

To the Members of the Master Car-Builders' Association and others having charge of Passenger and Freight Cars:

GENTLEMEN: The Committee on Framing, appointed at the last convention of the Master Car-Builders' Association, deem it of much more interest and value to the art of car-building, and to all those interested in it, to know your ideas of the best size and style of construction of Passenger and Freight Cars, than to know what may be in use on your road.

We believe that skill and inventive ability, ripened by experience, enable you to submit plans in advance of the cars now in use, and looking toward *standard cars of uniform construction.* Please send to the "Committee on Framing," at the "Rooms of the Master Car-Builders, 113 Liberty street, New-York City," a full set of Tracings from the drawings, embodying your ideas of the *best plan* and *size* for Passenger and Freight Cars, which tracings are to be carefully preserved for reference at the M. C. B.'s Rooms. Also, please answer the following questions, and give us all the information you can respecting the subject matter of this circular.

1st.—Have you Box Freight-Cars on your road more than 30 feet long? If so, how are they framed and trussed, and have they given good satisfaction?

2d.—Do you think it would be economy for railroad companies to have their Freight-Cars longer than 30 feet, and so constructed as to carry a load of 15 or more tons?

3d.—In your opinion would there be objections to carrying 15 or more tons upon an 8-*Wheel Car,* provided the car is capable of *carrying that weight?*

4th.—Can you make a good, substantial Box Freight Car, capable of carrying 15 tons, that will weigh not more than 15,000 lbs.? If not, how much more should it weigh?

5th.—Would the officers of your road entertain the idea of a *National or Standard Car, duplicate in all its parts,* except Wheels and Springs? The plan of such a car to be chosen from a sample car selected from one designed and built by each railway company, such selection to be made by the officers of railroad companies.

Your prompt attention will greatly oblige. On receipt of this, please inform us if you will send tracings. All replies should be addressed to the Chairman of Committee.

W. R. DAVENPORT, Chairman,
Erie Car-Works, Erie, Pa.
E. A. OLMSTEAD,
New-York Central and Hudson River R.R., New-York City.
H. A. WEBSTER,
New-York, Boston and Montreal R. R., Dutchess Junction, N. Y.

PURDIE'S PATENT SAFETY WASHER.—The working of this simple but ingenious device will be understood by referring to the illustrations in our advertising columns. It is made of malleable iron, and is so constructed as to be a positive nut-lock, holding the nut to its place with absolute certainty, without regard to shrinkage of timber, elongation of bolts, or wearing of heads and screws. It is adapted to either iron or wood-work, and particularly to car-trucks and fish-plate bolts. A large number of flattering testimonials in its favor from prominent railroad men and car manufacturers have been shown us, all of which concur in recommending it as an effective, durable, and economical device that will do all the inventor claims for it. It can be quickly and conveniently put on, dispenses with jam-nuts, prevents loss of nuts, and saves labor in replacing them.

Facetiæ.

AND now it is reported that there is a curve in the Central Railroad, just east of Little Falls, New-York, which is so short that engineers and "tail brakemen" on the same train frequently shake hands and borrow chews of tobacco of each other.

HERE is a description of a mean church, which has a moral in it: "After the old pastor died the deacons went about for a two-hundred-and-fifty-dollar minister, and you can get about as much minister for that price as you can get psalm-tunes out of a file."

THE Dutchman who refused to take a one-dollar bill because it might be altered from a ten, prefers stage traveling to railroads. The former, he says, rides him eight hours for a dollar, while the latter only rides him one. "De people can't sheat me."

AN industrious citizen of San Juan arose a few mornings ago while the festive lark was still snoring, and with a tin bucket under his arm went to the barn to milk the family cow. It was dark and rainy, and in fumbling about for old Brindle he got into the wrong pew and began to pail the off mule of his wagon team. He can't remember now which side of the roof he went out at, but his recollection of alighting on the picket fence is very vivid. He expects the bucket down in a few days.

AN amusing and apparently authentic story is current in English railway circles, the hero of which is a station-master in one of the Midland counties, who, after weeks of excessive labor, found an hour or two's leisure time in which to attend church. The unwonted bodily rest given by the cushioned pew, haply aided by the sermon, sent him off to sleep, out of which being awakened by some unusual noise, he astonished the congregation by shouting at the top of his voice, "Change for Nottingham, Derby, and the North," at the same time groping about for his lantern. He quickly, however, found that he had a prayer-book in his hand instead, into which, we are told, he quickly subsided, and the service, which for the moment had stopped, then proceeded anew.

THE fireman of the steam heating apparatus at the Detroit Central depot found a penny as he was raking over the hot ashes in the furnace, and he took it up with the tongs and placed it on a bench outside to cool off. It had hardly commenced to cool when a heavy man named Johnson, living in Saginaw, came along. He was talking business with a friend, and as he came to the bench he parted his coat-tails and sat down on the penny, remarking: "As I was saying, you can have forty acres for—whoop! Thunder and blazes—ouch—dash it—gosh to whoop!" He galloped around in wild amazement, the hot penny sticking to him like a brother, and it was two or three minutes before any one found out whether he had dropped down on a tack or been bitten by a dog. There was a heavy aroma of burning cloth and blistered meat, and Mr. Johnson stretched forth his arm and exclaimed that he should devote the remainder of his life to hunting down the fiend who thus planned to waylay him.

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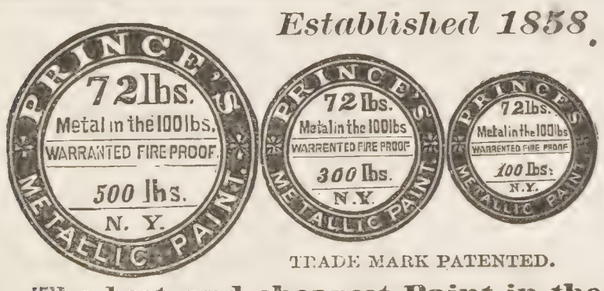
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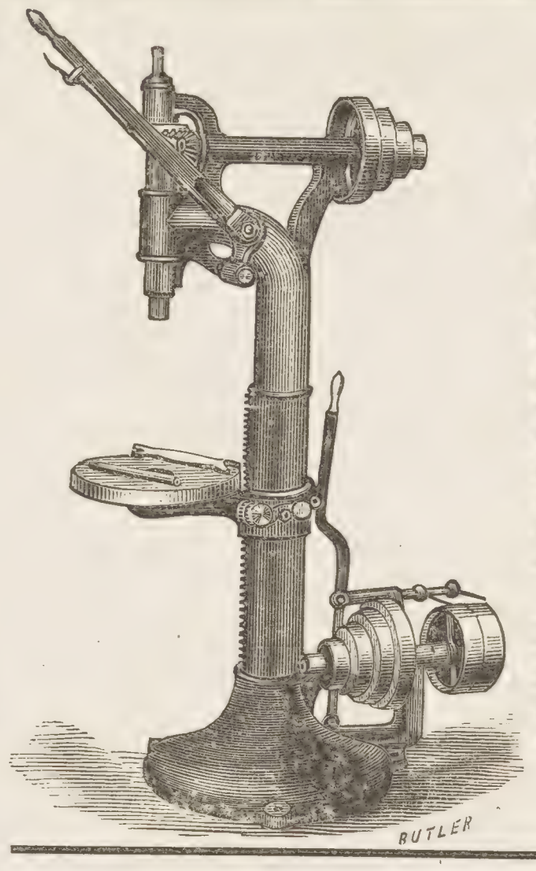
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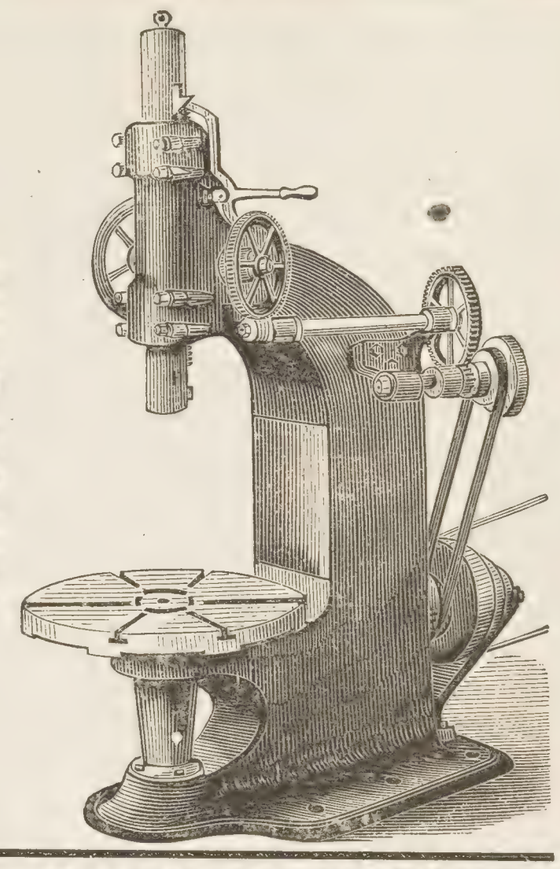


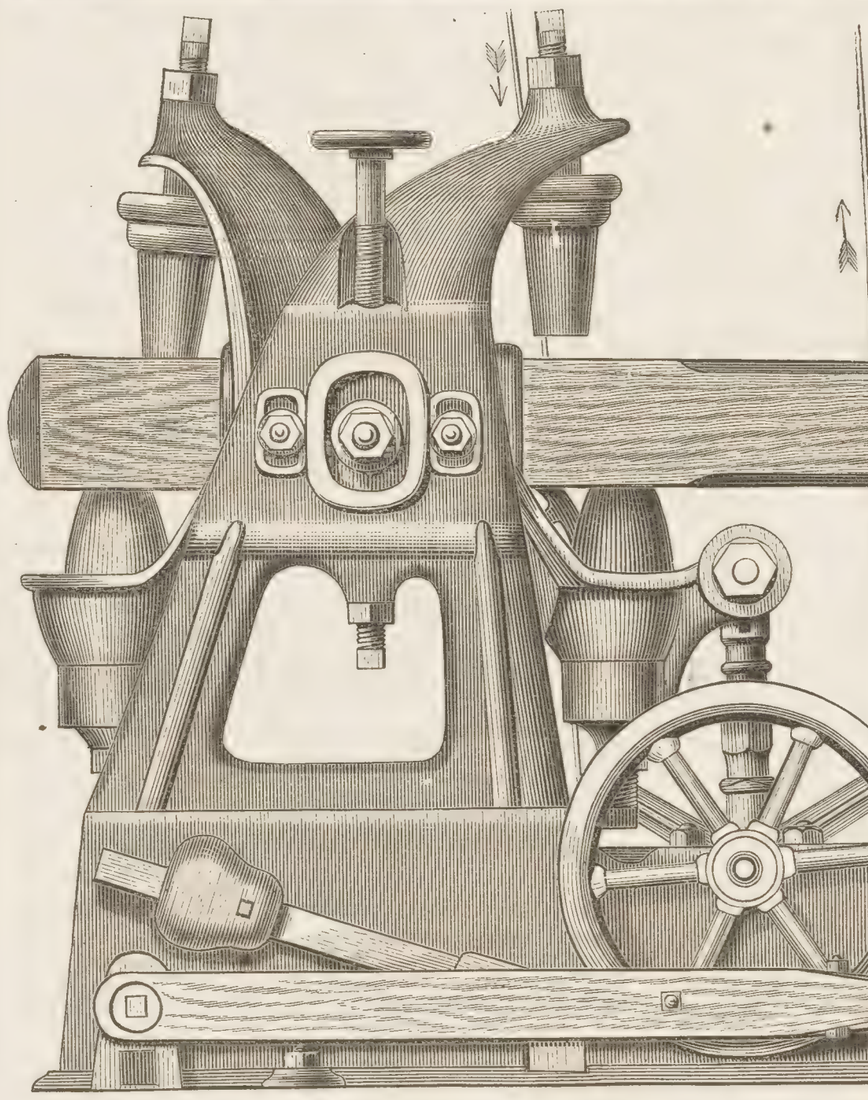
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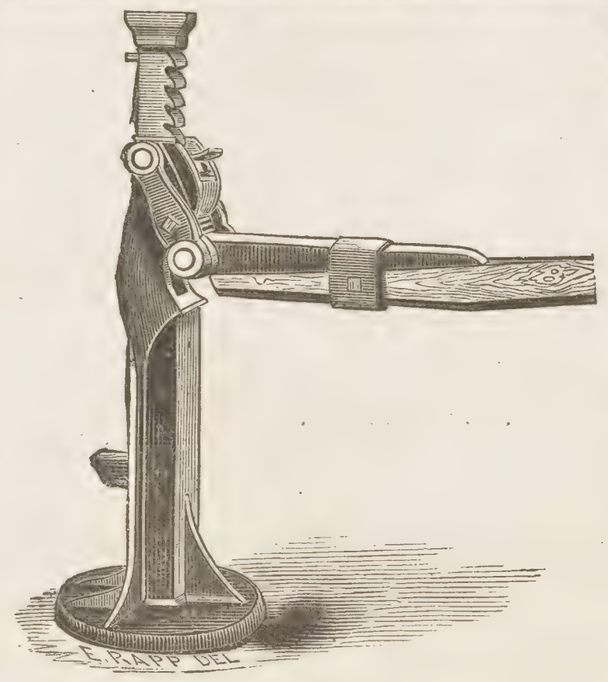
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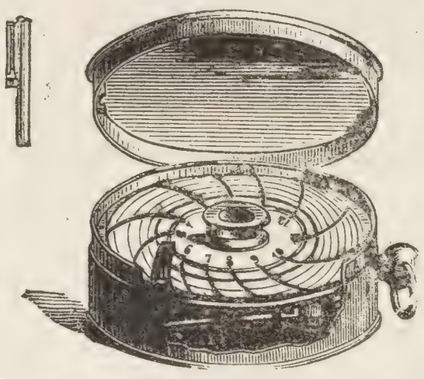
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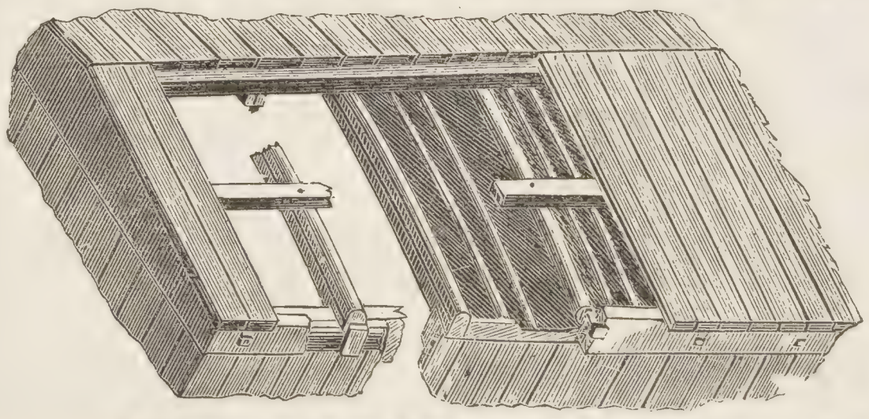
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Chesapeake & Ohio	§T. J. Hamer	H. C. Bassinger	Huntingdon, W. Va.
Cheraw & Darlington	D. W. Haines	A. M. Corrie	Florence, S. C.
Champlain Trans. Co	H. T. Calder		Burlington, Vt.
Cheshire & Ashuelot	F. A. Perry	F. A. Perry	Keene, N. H.
Charlotte, Columbia & Augusta	Robert King	J. C. Troeger	Columbia, S. C.
Chicago & Pacific	A. S. Gurnee		Chicago, Ill.
Chicago & Lake Huron			
Eastern Division	E. Hollis		Port Huron, Mich.
Western Division	W. C. Faulkner		Battle Creek, Mich.
Chicago & North-Western	§Geo. W. Tilton	William Campbell	Chicago, Ill.
Wiscon. Mad. & Mill. Divis		Wm. Campbell	Chicago, Ill.
Wiscon. Mad. & Mill. Divis.		Henry Hull	Fond du Lac, Wis.
Galena Division		Hugh Gray	Chicago, Ill.
Iowa Division	C. C. Elliott	Richard Wharton	Clinton, Iowa.
Peninsula Division	Geo. White		Escanaba, Mich.
Chicago & Alton	John A. Jackman	R. Reniff	Bloomington, Ill.
Chicago, Burlington & Quincy	‡Wm. Wilson	††W. W. Wilcox	Aurora, Ill.
Galesburg Division	James Lamb	H. J. F. Small	Galesburg, Ill.
Creston Division	Joel West		Creston, Iowa.
Burlington Division	John Bassler		Burlington, Iowa.
Chicago, Clinton & Dubuque	P. R. Sutton		Dubuque, Iowa.
Chicago, Dubuque & Minnesota	P. R. Sutton		Dubuque, Iowa.
Chicago, Rock Island & Pacific	T. B. Twombly	B. K. Verbryck	Chicago, Ill.
Chicago & Michigan Lake Shore		D. Sutherland	St. Joseph, Mich.
Chicago, Danville & Vincennes	J. B. Morgan		Danville, Ill.
Chicago, Milwaukee & St. Paul			
La Crosse & P. Du Chien Div.		Wm. E. Kittredge	Milwaukee, Wis.
Northern Div.		John Bailie	Milwaukee, Wis.
Iowa & Minn. Div.	J. Pettee	J. Pettee	Minneapolis, Minn.
Hastings & Dakota Division	C. C. Clements.		Hastings, Minn.
Chicago & Iowa	H. S. Bryan		Aurora, Ill.
Cincinnati, Wabash & Michigan	E. M. Porter		Wabash, Ind.
Cincinnati, Hamilton & Dayton	James Eckford	W. H. H. Allison	Cincinnati, Ohio.
Cincinnati & Indianapolis Junction	W. McKinzie	Edwin Beeny	Indianapolis, Ind.
Cincinnati, Lafayette & Chicago	Charles E. Gore.		Lafayette, Ind.
Cincinnati & Muskingum Valley	Leroy Kells	Daniel Jewell	Lancaster, Ohio.
Cincinnati, Sandusky & Cleveland	J. M. Sanborn		Sandusky, Ohio.
Cleveland, Col., Cin. & Indianapolis	‡L. S. Young	††William F. Smith	Cleveland, Ohio.
Indianapolis Division	A. R. McAlpine		Galion, Ohio.
Indianapolis Division		R. Attridge	Indianapolis, Ind.
Cincinnati Division	D. Carmichael	D. Carmichael	Delaware, Ohio.
Columbus Division	F. G. Kaufholz	Wm. Cleve	Cleveland, Ohio.
Cleveland & Pittsburg	N. E. Chapman	A. Steinbrunner	Cleveland, Ohio.
Cleveland, Mt. Vernon & Delaware	J. W. Holloway	J. W. Holloway	Akron, Ohio.
Cleveland, Tuscarawas Val. & Wheeling	W. F. Turreff.		Cleveland, O.
Cobourg, Peterboro & Marmosa	Wm. Polson.		Cobourg, Canada.
Columbus, Chicago & Indiana Central.	(See Pitts. Cinn. & St. Louis)		
Columbus & Hocking Valley	H. S. Wallace	H. S. Wallace	Columbus, Ohio.
Concord	Chs. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Portsmouth	C. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Claremont	J. N. Lander	A. Langmaid	Concord, N. H.
Connecticut River	§Wm. H. Stearns.		Springfield, Mass.
Connecticut Valley	C. W. Hollister	N. A. Smith	Hartford, Ct.
Connecticut Western	N. Slingland.		Hartford, Ct.
Contoocook River			Concord, N. H.
Conn. & Passumpsic Rivers	Geo. Kilby		Lyndonville, Vt.
Corning, Cowanesque & Antrim	O. C. Patchell	O. C. Patchell.	Corning, N. Y.
Cumberland Valley	A. S. Hull	C. W. Nitterhouse.	Chambersburg, Pa.
Cumberland & Pennsylvania	W. L. Jordan	Nathan Binnix	Mt. Savage, Md.
D			
Dakota Southern	Jas. Whitney	A. A. Meckling	Yankton, Dak.
Danbury & Norwalk.	Charles A. Craig.	C. A. Craig	Danbury, Ct.
Davenport & St. Paul	James Russell.		Davenport, Iowa.
Dayton & Union	A. J. Keenan	J. F. Feicht.	Dayton, Ohio.
Dayton & Michigan	John Black	W. H. H. Allison	Cincinnati, Ohio.
Delaware, Lackawanna & Western	Walter Dawson	Robert McKenna	Scranton, Pa.
Morris & Essex Division	W. H. Lewis	L. S. Barber	Hoboken, N. J.
Denver & Rio Grande	John Greenwood		Denver, Col.
Detroit, Ft. Wayne & Logansport	W. A. Carpenter.		Bankers, Mich.
Detroit & Milwaukee	C. M. Hanson		Detroit, Mich.
Detroit, Lansing & Lake Michigan	Tho. E. Roberts		Ionia, Mich.
Delaware & Hudson Canal Co.	‖R. C. Blackall.		Albany, N. Y.
Dorchester & Delaware.			Cambridge, Md.
Dubuque South-Western	James Rollo	James Rollo	Farley, Iowa.
Dutchess & Columbia	W. G. Vanbuskirk	H. A. Webster	Fishkill, N. Y.
Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett.	Dunkirk, N. Y.
E			
Eastern		J. P. Somerby.	Salem, Mass.
Eastern	John Thompson		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L. Weaver	Riverton, Ky.
East-Tennesee, Virginia & Georgia	C. A. Hodge		Knoxville, Tenn.
Erie Railway	§§Frank K. Hain.		Susquehanna, Pa.
Erie Railway	Robert Wallace		Susquehanna, Pa.
Erie Railway	V. Blackburn		Jersey City, N. J.
Erie Railway	F. M. Wilder	M. Wilder	Buffalo, N. Y.
Erie Railway	J. W. Chapman	J. W. Chapman	Hornellsville, N. Y.
Erie Railway		‖D. B. Goodell	Elmira, N. Y.
Erie Railway		‖J. B. Hill	Jersey City, N. J.
Erie Railway	J. Van Vechten	‖J. Van Vechten	Port Jervis, N. Y.
Erie Railway	A. T. Back		Rochester, N. Y.
Erie & Pittsburg	G. J. Parkin.	G. J. Parkin	Erie, Pa.
European & North Am. (of Maine)	A. O. Bailey	J. H. Brown	Oldtown, Maine.
Evansville & Crawfordsville	John L. White	Joseph Stiker	Evansville, Ind.
Evansville, Terre Haute & Chicago	§§Wm. Riley, Jr.		Terre Haute, Ind.
F			
Fitchburg	Geo. A. Cooledge	Enos Varney	Charlestown, Mass.
Fitchburg & Worcester	John Webster	Samuel Stevens	Fitchburg, Mass.
Flint & Pere Marquette	Sanford Keeler	‖R. B. More	East-Saginaw, Mich.
Florida	Ezra Gray	G. Hernandez	Fernandina, Fla.
Flushing & North Shore	Wm. La Suer	C. Wilkinson	Hunter's Point, L. I.
G			
Galveston, Harrisburg & San Antonio	Palmer Cady		Harrisburg, Texas.
Galveston, Houston & Henderson	Jno. G. Coulon	Wm. Macbeth	Galveston, Texas.
Georgia	William Hardman.	T. M. Preval,	Augusta, Ga.
Gilman, Clinton & Springfield	W. B. McKenna		Springfield, Ill.
Grand Tower & Carbondale.	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk		Warren Noyes	Gorham, Me.
Grand Trunk.	†Herbert Wallis	Wm. McWood	Montreal, Canada.
Grand Trunk			Sherbrooke, Can.
Grand Trunk.		B. J. Mitchell	Portland, Me.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne, Ind.
Great Western of Canada	†Wm. A. Robinson.	F. Childs	Hamilton, Canada.
Green Bay & Lake Pepin	J. H. Erwin.		Green Bay, Wis.
Greenville & Columbia	R. H. Anderson	R. H. Anderson	Helena, S. C.
H			
Hackensack & New-York.	Abra'm Angausen.		Hackensack, N. J.
Hanover Branch	John J. Bingley	Henry Britcher	Hanover, Pa.
Hannibal & St. Joseph	**Jno. MacKenzie		Hannibal, Mo.
Hartford, Providence & Fishkill	Edwin Garfield	V. D. Perry	Hartford, Ct
Housatonic	C. R. Morris.	J. J. Ferris	Falls Village, Ct.
Houston & Texas Central	L. C. Noble	James McGee	Houston, Texas.
Huntington & Broad-Top Mountain	W. W. Coller	M. Tellerhoof	Saxton, Pa.
I			
Illinois Central	**S. J. Hayes	W. B. Snow	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia, Ill.
North Division	J. B. Edams		Amboy, Ill.
Iowa Division	Thomas W. Place		Waterloo, Iowa.
Illinois Midland	J. G. Clifford	G. Clifford	Paris, Ill.
Illinois & St. Louis.	James Hazen		Bellville, Ill.
Indianapolis, Cincinnati & Lafayette	J. S. Patterson	S. Griffith	Cincinnati, Ohio.
Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Indianapolis & St. Louis	A. J. Sanborn		Mattoon, Ill.
Indianapolis, Bloomington & Western	Tho. V. Losee	A. J. Allen	Urbana, Ill.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ia.
International & Great Northern	R. B. Small		Palestine, Texas.
Intercolonial	Wm. Whitney	Edw. Shaffer	Moncton, N. B.
Iron	Perry Scott	Clem. Roetling	Ironton, Ohio.
Ithaca & Athens	F. A. Brown.		Ithaca, N. Y.
J			
Jacksonville, Pensacola & Mobile	H. D. Kennedy		Jacksonville, Fla.
Jeffersonville, Madison & Indiana	Reuben Wells		Jeffersonville, Ind.
Junction & Breakwater	J. A. Maguire.		Lewes, Del.
K			
Kalamazoo, Allegan & Grand Rapids			Kalamazoo, Mich.
Kansas City, St. Joseph & Council Bluff	Wm. D. Rowley	Wm. D. Rowley	St. Joseph, Mo.
Kansas Central	John Davis		Leavenworth, Kan.
Kansas Pacific	**L. H. Waugh		Wyandotte, Kansas.
Denver Pacific Div	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div.	**L. H. Waugh		Wyandotte, Kansas.
Junction City & Ft. Kearney Div	**L. H. Waugh.		Wyandotte, Kansas.
Arkansas Valley Div	**L. H. Waugh		Wyandotte, Kansas.
Kentucky Central	J. R. Ledyard	J. L. Hackathorn	Covington, Ky.
Keokuk & Des Moines Valley	S. W. Wakefield	M. Sessions	Keokuk, Iowa.
King's Mountain	E. Thomas	E. Thomas	Chester, S. C.
Knox & Lincoln	§§E. R. Hamlin.	Benj. Soule	Bath, Me.
Knoxville & Charleston			Knoxville, Tenn.
L			
Lackawanna & Bloomsburg	Chas. Graham	Chas. Graham	Kingston, Pa.
Lake Erie & Louisville	John Pero		Fremont, Ohio.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Lake Ontario Shore	Wm. Harris		Oswego, N. Y.
Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland, Ohio
Michigan Southern Division	Geo. W. Stevens		Elkhart, Ind.
" " "		S. S. Knapp	Adrian, Mich.
Toledo Division	Albert Congdon	Frank O. Bray	Norwalk, Ohio.
Erie Division	L. O. Gassett	J. Withyecombe	Cleveland Ohio.
Buffalo Division	W. L. Wallace	A. C. Robson	Buffalo, N. Y.
Lake Superior & Mississippi			St. Paul, Minn.
Lehigh Valley	John I. Kinsey		South-Easton, Pa.
Lehigh Valley	P. Hofecker	E. R. Brown	Weatherly, Pa.
Lehigh Valley	John Campbell	Mauch Chunk, Pa.	Delano, Pa.
Lehigh Valley	D. Clark		Hazleton, Pa.
Leavenworth, Lawrence & Gal	J. S. McCrum		Lawrence, Kansas
Little Rock & Fort Smith	D. R. Wing	D. R. Wing	Argenta, Ark.
London & Port Stanley			London, C. W.
Louisville, New-Albany & Chicago	Geo. Ruhlandt	Geo. Helfrich	New-Albany, Ind
Long Island	Chs. A. Thompson	C. A. Thompson	Hunter's Point, L I.
Louisville, Cincinnati & Lexington	S. S. Pilson	S. S. Pilson	Louisville Ky.
Louisville & Nashville	†Thatcher Perkins		Louisville, Ky.
Louisville & Nashville	D. P. Rennie	Isaac M. Owens	Louisville, Ky.
Louisville & Nashville	Jas. Montgomery		Bowling Green, Ky.
Nashville & Decatur Division	John Skidmore		Nashville, Tenn.
South & North Ala. Div.	Thos Jeffers	W. L. Gude	Birmingham, Ala.
South & North Ala. Div	C. H. Beale		Montgomery, Ala.
Memphis & Ohio Div.	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Louisville, Paducah & So. Western	W. D. Robb	F. A. Felton,	Elizabethtown, K

M

Macon & Augusta			Macon, Ga.
Macon & Brunswick	R. Wagnon	R. Wagnon	Macon, Ga.
Macon & Western	D. M. Gogel	James A. Knight	Macon, Ga
Maine Central	J. W. Philbrick	J. W. Philbrick	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div	John Ellis	C. H. Kenison	Augusta, Me.
Maine Central Division	John F. Merrill		Waterville Me.
Manchester & Lawrence	Chas. L. Eastman	M. W. Dickerman	Concord, N. H
Marietta, Pittsburg & Cleveland	W. J. Adams		Marietta, Ohio.
Marietta & Cincinnati	E. Bosley	E. Bosley	Chillicothe, Ohio
Marquette, Houghton & Ontonagon	T. J. Shellhorn	H. D. Lyons	Marquette, Mich.
Maryland & Delaware	Samuel Peters		Greensboro, Md.
Memphis & Little Rock	Tho. Rennell	P. Twitchell	Argenta, Ark
Memphis & Charleston	A. Ross	A W. Drew	Memphis, Tenn.
Memphis & Charleston	H. N. Burford	Fabien Varin	Huntsville, Ala.
Mineral Point	Robert Hay	Robert Hay	Mineral Point, Wis.
Mineral Range	C. H. Fox		Hancock, Mich.
Mississippi & Tennessee	Geo. Haszinger	J. Riny	Memphis, Tenn.
Michigan Central	§§Geo. S. Chalender	Geo. S. Chalender	Jackson, Mich.
Michigan Central		‖Henry Whiting	Detroit, Mich.
Midland Pacific	A. C. Stiles		Lincoln, Neb
Mississippi Valley & Western	J. S. Pickering		Canton, Mo.
Missouri, Iowa & Nebraska	J. G. Crozier		Alexandria, Mo.
Missouri, Kansas & Texas	T. G. Gorman		Parsons, Kan.
Missouri, Kansas & Texas		J. Townsend	Sedalia, Mo.
Missouri, Kansas & Texas	J. E. Wiggins		Hannibal, Mo.
Missouri River, Fort Scott & Gulf	John S. McCrum	Alex. Montier	Kansas City, Mo
Missouri River, Fort Scott & Gulf		Josiah Stahl	Wyandotte, Kan.
Mobile & Montgomery	James McFarland	L. Barham	Montgomery, Ala
Mobile & Girard	C. D. Wall		Girard, Ala.
Mobile & Ohio		John McHugh	Mobile, Ala.
Mobile & Ohio	R. McDougal	I. T. Booth	Whistler, Ala.
Mobile & Ohio	B. S. Herring		Macon, Miss.
Mobile & Ohio	R. H. Briggs		Jackson, Tenn.
Montgomery & West-Point	J. McVey	J. T. Daniels	Montgomery, Ala.
Montgomery & Eufaula	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Algiers, La.
Montreal Northern Colonization	§§C. G. C. Simpson		Montreal, Can.

N

Nashville & Chattanooga	John U. Eastman	J. G. Sawyer	Nashville, Tenn.
Naugatuck	Henry Hanford	George W. Gray	Bridgeport, Ct.
New-Bedford	G W. Reynolds	Robert Chase	Taunton, Mass.
New-Brunswick	P. Logan	C. M. Kinnon	Fredericton, N. B.
New-Brunswick & Canada	Tho. Armstrong	G. Houlton	St. Andrew's, N. B.
New-Haven & Northampton	Henry Fox	Henry Fox	New-Haven, Ct.
New-Jersey Midland	C. J. Clifford		Wortendyke, N.J.
New-Jersey Southern	Rufus Blodgett		Manchester, N. J.
New-Orleans & Ohio	John R. Jordan	John R. Jordan	Paducah, Ky.
New-Orleans, St. Louis & Chicago		‡‡J. D Billings	McComb City, Miss.
New-Orleans, St. Louis & Chicago	§§L. H. Sellars		Water Valley, Miss.
New-Orleans, St. Louis & Chicago		G. H. White	McComb City, Miss.
New-Orleans & Mobile	§Josiah Bettis	D. C. Roland	Mobile, Ala.
New-York, Kingston & Syracuse	A. Q. Mackenbush	G. Dikeman	Syracuse, N. Y.
New-York & Harlem	Wm. M. Strong	C. E. Garey	New-York.
New-York Central & Hudson River		††Leander Garey	New-York.
New-York Central Division	‡G. B. Van Vorst	D. Hoit	West-Albany, N. Y.
New-York Central Division	Henry Watkeys		Syracuse, N. Y.
New-York Central Division	Amos Gould	James Leary	Rochester, N. Y.
New-York Central Division	Jas. Butman	Wm. Johnson	Buffalo, N. Y.
New-York Central Division	S. L. White	George Rowe	Niagara Falls, N. Y
Hudson River Division	‡Wm. Buchanan	E. A. Olmstead	New-York City.
Hudson River Division	R. Greenalch	J. J. Conaghty	E. Albany. N. Y.
New-York, Boston & Montreal	W. G. Van Buskirk	H. A. Webster	Dutchess Junc., N.Y
New-York & Oswego Midland	§§W. A. Dripps		Oswego, N. Y.
Eastern Division	J. Minchell		Middletown, N. Y.
Middle Division	Tho. Howard		Norwich, N. Y.
Northern Division	Edward Van Vleck	T. D. Day	Oswego, N. Y.
New-York & New-England	Geo. E. Boyden	Elias E. Pratt	Boston, Mass.
New-York, Providence & Boston	Jas. H. Anderson	Jas. H. Anderson	Providence, R. I.
New-York, New-Haven & Hartford	§§H. Kittendorf	James Denver	New-Haven, Ct.
New-York, New-Haven & Hartford	J. O. Chapman	F. Leppens	Hartford, Ct.
Northern Central			Baltimore, Md.
Northern Central		G. W. Demarest	York, Pa.
Northern New-Hampshire	James W. Lander	Albert Langmaid	Concord, N. H.
Northern of Canada	P. Clark.	P. Clark	Toronto, Can.
Northern Pacific	**H. A. Towne		St. Paul, Minn.
Minnesota Division	W. H. Lewis	W. S. Heathcote	Brainerd, Minn.
Lake Superior & Miss. Div	G. H. Smith	John Hill	St. Paul, Minn.
Dakota Division	C. W. Rossiter		Fargo, D. T.
Pacific Division	J. F. Curtis		Kalama, W. T.
North-Carolina	Rufus D. Wade	B. G. Sergeant	Co. Shops, N. C.
North-Louisiana & Texas	C. H. Tull		Monroe, La.
North-Lebanon		Henry B. Oves	Lebanon, Pa.
North-Pennsylvania	Franklin Roop	Franklin Roop	Philadelphia, Pa.
North-Eastern	D. W. Haines	A. M. Corrie	Florence, S. C.
Norwich & Worcester	Richard Colburn	G. R. Bentley	Norwich, Ct.

O

Ohio & Mississippi		G. Hibbert	Cochran, Ind.
Ohio & Mississippi	‡J. D. W. Potts		Seymour, Ind.
Oil City & Pithole	George Thompson		Pithole, Pa
Oil Creek & Alleghany River	H. J. Bookhammer	John Monks	Oil City, Pa.
Old Colony & Newport	J. K. Taylor	A. Gleason	Boston, Mass.
Oregon & California	§§J. Brandt.		Portland, Oregon.
Owensburg & Russellville	J. R. Osborne		Owensburg, Ky.

P

Paducah & Memphis	Alex. Forsyth		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Panama	Chas. E. Stewart		Aspinwall, N. G.
Pacific of Missouri	§§John Hewitt	E. Martin	St Louis, Mo.
Pennsylvania	§§T. N. Ely		Altoona, Pa.
Pennsylvania	H. D. Garrett	I. W. Van Houten	W. Philadelphia, Pa.
Pennsylvania	E. L. Caum	Samuel W. Myers	Harrisburg, Pa.
Pennsylvania	G. W. Strattan	John P. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver	R. S. Ramsey	Pittsburg, Pa.
New-Jersey Division		David H. Baker	Jersey City, N. J.
West-Penn. Division	C. B. Street	M. H. Fales	Blairsville, Pa.
Peoria & Rock Island	Geo. Gregg		Peoria, Ill.
Peoria, Pekin & Jacksonville	R. F. Hurd	Jas. J. Doyl	Pekin, Ill.
Petersburg & Weldon	R. B. Andrews	Alex. Wright	Petersburg, Va.
Philadelphia, Wilmington & Baltimore	S. A. Hodgman.	Wm. T. Worth	Wilmington, Del.
Philadelphia & Baltimore Central	S. D. Danfield	Samuel D. Danfield	Chester, Pa.
Philadelphia and Erie	Martin Walls		Sunbury, Pa.
	W. L Forster		Renovo, Pa.
	W. L. Holman		Kane, Pa.
	W. T. Smith.		Erie, Pa.
	§§Howard Fry		Erie, Pa.
Philadelphia & Reading	L. B. Paxson	Aaron Steinbach	Reading, Pa.
Germantown & Norris'n Div	Jackson Richards		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis	E. Pierce		Dennison, Ohio.
Pittsburg & Columbus Division		Thos. D. Furgusen	Steubenville, Ohio.
Little Miami Division		M. P. Ford	Columbus, Ohio.
Little Miami Division	J. H. Setchel		Cincinnati, Ohio.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlin	Columbus, Ohio.
Col., Cin. & Ind. Division	Geo. H. Prescott	Geo. H. Prescott	Logansport, Ind.
Pittsburg, Fort Wayne & Chicago	S. M. Cummings	John Marquis	Allegheny, Pa.
Pittsburg, Fort Wayne & Chicago	J. M. Boon.	Israel Lee	Fort Wayne, Ind
Pittsburg, Fort Wayne & Chicago		J. J. Kirkland	Crestline, Ohio.
Pittsburg, Virginia & Charlston	W. Lininger		Pittsburg, Pa.
Pittsburg, Washington & Baltimore	§Wm. Stearns		Connellsville, Pa.
Pittsburg, Washington & Baltimore	J. E. Sampsel	J. M. Leach	Pittsburg, Pa
Portland & Rochester	John G. Brady	John G. Brady	Portland, Me.
Portland & Oxford Central	Geo. W. Battles	Geo. W. Battles.	Buckfield, Me.
Portland, Saco & Portsmouth	John Donnell		Portland, Me.
Port Royal	Wm. Campbell	E. Hubard	Port Royal, S. C.
Port Hope, Lindsay & Beaverton	H. G. Taylor	H. G. Taylor	Port Hope, Can.
Portsmouth, Gt. Falls & Monmouth	James Tucker	E. Fall	Union Village, N.H.
Poughkeepsie & Eastern	John L. Driscoll	Jerry Wigg	Poughkeepsie, N. Y.
Providence & Worcester	Joseph Kelly	Olney L. Smith	Providence, R. I.
Providence, Warren & Bristol	Rufus Smith	J. Brightman	Bristol, R. I.

Q

Quincy, Alton & St. Louis	J. O. Gravell	W. G. Gilbert	Quincy, Ill.
Quincy, Missouri & Pacific			Quincy, Ill.

R

Raleigh & Gaston	B. R. Harding	B. R. Harding	Raleigh, N. C.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Richmond, Fredericksburg & Potomac	H. Kuhn	W. H. Trainham	Richmond, Va.
Richmond, Danville & Piedmont	John McFarland	J. B. Vaughan	Richmond, Va.
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond, Va.
Richmond & York River	C. H. Harris	J. L. Thompson	Richmond, Va.
Rive De Loup	P. A. Logan	C. R. McKinnin	Fredericton, N. B.
Rome, Watertown & Ogdensburg	Abram Klohs	H. H. Sessions	Rome, N. Y.
Rome, Georgia	O. W. Harbin	O. W. Harbin	Rome, Ga.
Rochester & Genesee Valley	M. E. Brown	M. Wilder	Buffalo, N. Y.
Rockford, Rock Island & St. Louis	Joseph Elder	T. F. Nolte	Beardstown, Ill.

S

Saginaw Valley & St. Louis	W. S. Thompson		Saginaw, Mich.
San Antonio & Mexican Gulf	W. T. Bingham		Victoria, Texas.
Savannah & Charleston	P. J. Hutson	J. D. Murphy	Charleston, S. C.
Seaboard & Roanoke	§§M. M. Pendleton		Portsmouth, Va.
Selma & Gulf	Wm. T. Daughtrey		Selma, Ala.
Selma, Rome & Dalton		W. W. Peirce	Selma, Ala.
Selma, Marion & Memphis	Dolphus Gay		Marion, Ala.
Sheboygan & Fond du Lac	John Hickey	John Hickey	Sheboygan, Wis
Sioux City & Pacific	C. H. Foster		Missouri Val., Iowa.
Southern Pacific of California	J. P. Wilson	F. N. Bellisle	San Francisco, Cal.
South-Carolina	W. B. Smith	John Reed	Charleston, S. C.
Southern Central	Chas. G. Brown	H. Mooney	Auburn, N. Y.
Southern, of Long Island	Mark Brear	C. Wilkinson	Brooklyn, N. Y.
Southern Minnesota			Wells, Minn.
South-Western of Georgia	C. D. Wall		Columbus, Ga
South-Western of Georgia	D. M. Gogel	James A. Knight	Macon, Ga.
South Shore	Warren E. Ray		Cohasset, Mass.
South Side of Long Island	A. P. Doane	A. P Doane	Williamsburg, L. I.
Spartanburg & Union	J. N. Benner	Jacob Rice	Union C. H., S. C
Springfield, Athol & Northeastern	W. E. Granger		Springfield, Mas.
Springfield, Illinois & So. Eastern	John W. Warren		Pana, Ill.
Stanstead, Shefford & Chambly	W. H. Smith		Waterloo, C. E.
Stockton & Ione		W. T. Hoyt	Stockton, Cal.
Stonington & Providence	J. H. Anderson	J. H. Anderson	Providence, R. I.
St. Croix & Penobscot	Edward Bolton	A G. Page	Milltown, Me.
St. Joseph & Denver City	E. Sleppy		St. Joseph, Mo.
St. Lawrence & Ottawa	Calvin Dame	Calvin Dame	Prescott, Canada.
St. Louis, Iron Mountain & Southern	O. A. Haynes	Oscar Doolittle	Carondelet, Mo.
Arkansas Division	L. Finlay	L. Finlay	Little Rock, Ark.
St. Louis, Vandalia, T. Haute & Ind.	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Indianapolis Division	Wm. Riley		Terre Haute, Ind.
Vandalia Division		A. J. Sanborn.	Effingham, Ind.
St. Louis, Alton & Terre Haute	**Beriah Warren		St. Louis, Mo.
St. Louis & South-Eastern	‖L. B. Salisbury		Mt. Vernon, Ill.
Nashville Division	‖H. H. Osborne		Edgefield, Tenn.
St. Paul & Pacific	J. C. Monroe	T. W. Heathcote	St. Paul, Minn.
St Paul & Sioux City	F. C. Butterfield	J. W. Lydic	Shakopee, Minn.
St. Louis, Kansas City & Northern	W. H. Selby	C. S. Buck	Moberly, Mo.
Sullivan & Erie			Tonawanda, Pa.
Syracuse, Binghamton & New-York	H. H. Dawson	David Burling	Syracuse, N. Y.
Syracuse Northern	W. Garrison	L. W. Smith	Syracuse, N..

T

Terre Haute & Indianapolis	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Tennessee & Pacific	William McKeand	William McKeand	Nashville, Tenn.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	J. A. Hanglin		Marshall, Texas
Tioga	Peres Bonny	D. H. Stratton	Blossburg, Pa
Toledo, Peoria & Warsaw	W. O. Hewitt	R. M. Hemphill	Peoria, Ill.
Toledo, Wabash & Western	§J. B. Morse		Fort Wayne, Ind
Toledo, Wabash & Western	‖John C. Wills		Lafayette, Ind.
Toledo, Wabash & Western	Jacob Johann		Springfield, Ill.
Toledo, Wabash & Western		U. H. Kohler	Toledo, Ohio.
Toronto, Grey & Bruce	Wm. Bowstead		Toronto, Can.
Toronto & Nipissing	J. Haggus		Toronto, Canada.
Troy & Boston	Foster Church	R. V. Coon	Troy, N. Y.

U

Union Pacific	§I. H. Congdon	‡‡Geo. E. Stevens	Omaha, Nebraska.
Eastern Division		‖A. M. Collett	Omaha, Neb.
Eastern Division		‖H. P. Makely	Grand Island, Neb.
Mountain Divison		‖Jno. E. Davis	Cheyenne, W. T.
Laramie Division		‖Floyd Heavaner	Laramie, W. T.
Western Division		‖C. A. Phipps	Evanston, U. T.
Utah Central	Thos. Pierpont	Thos. Pierpont	Salt Lake City.
Utica & Black River	John Bailey	David James	Utica, N. Y.
Utica, Chenango & Susquehanna	C. H. Brown		Utica, N. Y.

V

Vermont Central	J. M. Foss	J. M. Foss	St. Albans, Vt.
Harlem Extension Div	C. S. Clapp	C. S. Clapp	Bennington, Vt.
New-London Northern Division	J. W. Dow	S. W. Caulkins	New-London, Ct.
Ogdensburg & L. Champlain Div.	William A. Short	J. R. Ames	Malone, N. Y.
Rutland Division	N. L. Davis		Rutland, Vt.
Vermont & Massachusetts		Jacob Marsh	Fitchburg, Mass.
Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.
Virginia & Truckee	Wm. Bowker		Carson, Nev.

W

Wash. City, Va. Midland & Gr. Southern	—— Waddy	J. T. Nalls	Alexandria, Va.
Washington & Ohio	Edward Dunn	Joshua Harrison	Alexandria, Va.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Welland	James Taylor	James Chase	St. Catharine, C. W.
Westchester & Philadelphia	John Moyer	N. Pawling.	Philadelphia, Pa.
Western & Atlantic	John H. Flynn	Wm. Grambling	Atlanta, Ga.
Western Maryland	Wm. Lannan	J. H. Nussear	Union Bridge, Md.
Western North-Carolina	J. D Hollister	J. D. Hollister	Salisbury, N. C.
Western R. R. N. C	M. W. Atkinson	M. W. Atkinson	Fayetteville, N. C.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
West-Feliciana	R. C. Brower	Wm. Grawling	Woodville, Miss.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
West-Wisconsin	L. T. Mead	J. L. Adam	Hudson, Wis.
White Water Valley	A. W. Britton		Harrison, Ohio.
Wilmington, Columbia & Augusta	W. H. Turrintine		Wilmington, N. C.
Wilmington & Weldon	John Bissit	C. R. Clowe	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Wilmington & Reading	H. M. Missimer		Reading, Pa.
Winona & St. Peter	F. C. Ford	H. L. Preston	Winona, Minn.
Wisconsin Central	G. Campbell		Stevens' P't, Wis.
Worcester & Nashua	Albert Griggs.	Albert Griggs	Worcester, Mass

DIRECTORY
OF
Railway Superintendents and Purchasing Agents
THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director. ‡ Ass't. Gen. Supt. § Ass't Supt.

A

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Arkansas Central	James A. Tappan		Helena, Ark.
Alabama Central	John M. Bridges		Selma, Ala.
Albany & Susquehanna	*C. F. Young		Honesdale, Pa.
Atchison, Topeka & Santa Fe	C. F. Morse	C. F. Morse	Topeka, Kansas.
Atchison & Nebraska	J. F. Barnard	J. F. Barnard	St. Joseph, Mo.
Atchison & Nebraska	*Geo. H. Nettleton		Kansas City, Mo.
Alabama & Chattanooga	C. H. Stanton	T. J. Carlile	Meridan, Miss.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Pittsburg, Pa.
Atlanta & Richmond Air Line	R. Y. Sage		Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	R. B. Browne	Meadville, Pa.
First Division	J. T. Odell		Meadville, Pa.
Second Division	A. L. Dunbar		
Third and Fourth Division	T. A. Phillips		Galion, Ohio.
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.
Allegheny Valley	J. J. Lawrence	John L. Awl	Pittsburg, Pa.
Adirondack	C. H. Ballard		Saratoga, N. Y.

B

Baltimore & Ohio	Thos. R. Sharp	Benj. Williams	Baltimore, Md.
Central Ohio & Lake Erie Div.	Wm. Walker		Columbus, Ohio.
Baltimore & Potomac	Geo. C. Wilkins	A. W. Sumner	Baltimore, Md.
Bangor & Piscataquis	M. H. Angel	L. H Eaton	Bangor, Maine.
Boston, Barre & Gardner	I. N. Ross		Worcester, Mass.
Boston & Albany	*Wm. Bliss		Boston, Mass
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & Providence	A. A. Folsom	A. A. Folsom	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood		Fitchburg, Mass.
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A. Dodge	Lyon & Vose	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood	Boston, Mass.
Boston, Lowell & Nashua	W. M. Parker.		Boston, Mass.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Brunswick & Albany	C. L. Schlatter		Brunswick, Ga.
Burlington & Missouri River (in Neb.)	Wm. Irwin.		Plattsmouth, Neb.
Burlington, Cedar Rapids & Minnesota	W W. Walker	S. L. Dows	Cedar Rapids, Ia.
Burlington & South-Western	R. T. Hosford		Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. H. Potter	N. M. Whitside	Corry, Pa.

C

Cairo & St. Louis	J. L. Hinkley	C. Ritsema	St. Louis, Mo.
Cairo & Vincennes	Henry L. Morrill		Cairo, Ill.
Camden & Atlantic	§F. A. Lister	J. L. Wendell	Camden, N. J.
Canada Central, Brockville, & Ottawa	H. P. Alden		Brockville, Can.
Canada Southern	*L. D Rucker		Toledo, Ohio.
Canada Southern		E. W. Porter	St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua, Pa.
Cayuga Lake	J. L. Grant		Ithaca, N. Y.
Central Branch Union Pacific	W. F. Downs	W. F. Downs	Atchison, Kan.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Central Pacific	‡John Corning		Sacramento, Cal.
Western Division	E. C. Fellows		Lathrop, Cal.
Visalia Division	E. C. Fellows		Lathrop, Cal.
Truckee Division	Frank Free		Wadsworth, Nev.
Humboldt Division	R. S. Matteson		Carlin, Nevada.
Oregon Divison	J. A. Fillmore		Sacramento, Cal.
Sacramento Division	J. A. Fillmore		Sacramento, Cal.
Salt Lake Division	R. H. Pratt		Ogden, Utah.
California Pacific Division	A. D. Wilder		Vallejo, Cal.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	Thos. Dodamead	J. A. Netherland	Richmond, Va.
Middle Division	H. D. Chapin		Staunton, Va.
Charlotte, Columbia & Augusta	James Anderson.		Columbia, S. C.
Cheshire	R. Stewart	H. H. Stone	Keene, N. H.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt	R. W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	J. B. Mulliken.		Escanaba, Mich.
Madison Division	C. A. Swineford.		Baraboo, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis.
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver.		Clinton, Iowa.
Western Iowa Division	John A. Head		Boone, Iowa.
Chicago & Alton	J. C. McMullen	A. V. Hartwell	Chicago, Ill.
Chicago, Burlington & Quincy	R. Harris	H. J. Higgins	Chicago, Ill.
Chicago Burlington & Quincy	‡C. H. Hudson		Chicago, Ill.
Eastern and Middle Division			Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota.	C. Harris	F. I. Massey	Dubuque, Iowa.
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	*Geo. S. Bowen	James Penny	Chicago, Ill.
Chicago & Pacific	J. M. Whitman		Chicago, Ill.
Chicago & Paducah			Streator, Ill.
Chicago, Rock Island & Pacific.	Hugh Riddle.	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chciago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.
Chicago & Michigan Lake Shore	*Geo. C. Kimball	Wm. R. Morrison	St. Joseph, Mich.
Chicago, Danville & Vincennes	L. Pearson	C. B. Mansfield	Chicago, Ill.
Chicago, Milwaukee & St. Paul	*S. S. Merrill	J. J. Slocum	Milwaukee, Wis.
Chicago, Pekin & Southwestern	W. P. Sisson		Streator, Ill.
Chicago & Canada Southern	D. Edwards		Toledo, Ohio.
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.
Cincinnati & Muskingum Valley	C. C. Wait		Zanesville, O.
Cincinnati, Richmond & Chicago	Lewis Williams		Cincinnati, Ohio.
Cincinnati & Martinsville	T. C. Burnside.		Franklin, Ind.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Cincinnati & Terre Haute			Terre Haute, Ind.
Cin., Cumberland Gap & Charleston	W. J Taylor		Knoxville, Tenn.
Cincinnati Hamilton & Dayton	Lewis Williams.	P. Hickey	Cincinnati, Ohio.
Cincinnati, Hamilton & Indianapolis	Lewis Williams		Cincinnati, Ohio.
Cincinnati, Lafayette & Chicago	E. H. Waldron	G. G. Hadley	Lafayette, Ind.
Cincinnati, Sandusky & Cleveland	*D. W. C. Brown		Sandusky, Ohio.
Cleveland, Columbus, Cincinnati & Ind.	E. S Flint		Cleveland, Ohio.
Indianapolis Division	C. C. Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division.	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Cleveland, Mt. Vernon & Delaware.	G. A. Jones		Mt. Vernon, Ohio.
Cleveland, Tuscarawas Val. & Wheeling	*E. B. Thomas	W. W. Card, *Supt.*	Cleveland, Ohio.
Colorado Central	P. J. Nichols.		Golden, Col.
Columbus & Hocking Valley	M. M Green		Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H.E.Chamberlin.	H. E. Chamberlin.	Concord, N. H.
Connecticut River	John Mulligan	John Mulligan.	Springfield, Mass.
Connecticut & Passumpsic Rivers	Geo. A. Merrill	Geo. Killey	Lyndonville, Vt.
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Corning, Cowanesque & Antrim	A. H. Gorton	R. J. Burnham	Corning, N. Y.
Cumberland Valley	I. F. Boyd	I. F. Boyd	Chambersburg, Pa.
Cumberland & Pennsylvania	J. A. Millholland		Mt. Savage, Md.

D

Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	J. R. Meckling	J. R. Meckling	Sioux City, Iowa.
Davenport & St. Paul	N. H. Wood		Davenport, Iowa.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware & Hudson Canal Co.	*C. F. Young		Honesdale, Pa.
Albany & Susq. Division	H. S. Morse		Oneonta, N. Y.
Rensselaer & Saratoga Div.	H. B. Smith		Troy. N. Y.
Delaware, Lackawanna & Western		G.W. B. Cushing.	New-York City.
Delaware, Lackawanna & Western	W. F. Halstead.		Scranton, Pa.
Morris & Essex Division	Andrew Reasmer		Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus. Division	George F. Thompson		Utica, N. Y.
Denver & Rio Grande	W. W. Borst	W. S. Jackson	Denver, Col.
Detroit & Bay City	T. B. Sargent	D. A. Waterman.	Detroit, Mich.
Detroit and Milwaukee	W. K. Muir	John S. Lorimer.	" "
Detroit, Hillsdale & Indiana	W. F. Parker.		Ypsilanti, Mich.
Detroit, Eel River & Illinois	A. B. Southard		Denver, Ind.
Detroit, Lansing & Lake Michigan	A. H. Reese.	C. D. Childs.	Detroit, Mich.
Dorchester & Delaware	J. M. Murphy.		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer.	C. V. DeForest	Dunkirk, N. Y.
Dubuque & South-Western.	J. P. Farley		Dubuque, Iowa.

E

East Alabama & Cincinnati	B Boyle		Opelika, Ala.
East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern (Mass.)	*C. F. Hatch	C. W. Pratt	Boston, Mass.
Erie & Pittsburg	J. M. Kimball		Erie, Pa.
Erie Railway,	E. S. Bowen	Henry Bowman	New-York City.
Erie	P. P. Wright		New-York, N. Y.
Eastern Division	E. O. Hill		Port Jervis, N. Y.
Delaware Division	Benj. Thomas		Port Jervis, N. Y.
Rochester Division	M. E. Brown		Rochester, N. Y.
Susquehanna Div.	C. W. Gardner		Elmira, N. Y.
Buffalo Division	R. G. Taylor		Buffalo, N. Y.
Western Division	J. S. Beggs		Buffalo, N. Y.
Erie & Pittsburg		Wm. Mullins	Pittsburg, Pa.
European & North-American	M. H. Angel	M. H. Angell	Bangor, Maine.
Evansville & Crawfordsville	John E. Martin.		Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.

F

Fitchburg	Chas.L.Haywood.	John Adams	Boston, Mass.
Flint & Pere Marquette	Sanford Keeler	Geo. C. Cook	East-Saginaw, Mich.
Flushing & North-Shore	I. D. Barton		Hunter's Point, L. I.
Flushing & North-Shore		A. E. Godeffroy	New-York City.
Fort Wayne, Jackson & Saginaw	P. B. Loomis		Jackson, Mich.
Fort Wayne, Muncie & Cin	W. W. Worthington		Fort Wayne, Ind.

G

Galveston, Harrisburg & San Antonio	Hardy Eddins	J. W. Pierce.	Galveston, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Georgia	S. K. Johnson	John Vaughn	Augusta, Ga.
Gilman, Clinton & Springfield	D. H. Conklin		Springfield, Ill.
Grand Rapids & Indiana.	*C. E. Gorham		Fort Wayne, Ind.
S. Division	J. M. Matheany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich.
Grand Rapids & Indiana	*W. O. Hughart	William Mullins	Pittsburg, Pa.
Grand Trunk	*J. Hickson	John Taylor	Montreal, Canada.
East Division	Henry Bailey		Montreal, Canada.
West Division	W. J. Spicer		Toronto, Canada.
Grand Tower and Carbondale	H. V. Olyphant.	Wm. W. Harris	Grand Tower, Ill.
Great Southern of Ga. & Fla.	M. H. Alberger.		Jacksonville, Fla.
Great Western (Canada)	Andrew Watson.	Robert Beatty	Hamilton, Canada.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.

H

Hannibal & St. Joseph	L. W. Towne	L. W. Towne. / W. J. Hilton. / L. W. Morse.	Hannibal. Mo.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin.	D. S. Draper	Bridgeport, Ct.
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	W. H. Vaughan		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top.	J. McKillips	B. A. Knight	Huntingdon, Pa.

I

Illinois Central.	*Jas. C. Clarke	O. Ott	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois Midland	D. Hitchcock	‡P. Campbell	Terre Haute, Ind.
Illinois & St. Louis	W. K. McComas		St. Louis, Mo.
Indianapolis, Bloomington & Western	J. E. Gimperling		Indianapolis, Ind.
Indianapolis, Bloomington & Western	Geo. B. Wright, Receiver		Indianapolis, Ind.
Indianapolis, Cincinnati & Lafayette	Geo. L. Barringer	E. V. Cherry	Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna.		Indianapolis, Ind.
Indianapolis & Vincennes		Wm. Mullins	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward	J. W. Morse	St. Louis, Mo.
Indianapolis, Peru & Chicago	C. B. Robinson	D. Macy.	Indianapolis, Ind.
Michigan City Division	E. C. Murphy		La Porte, Ind.
Intercolonial Railway	Lewis Carvell	Sam. Watson	Moncton, N. B.
International & Great Northern	H. M. Hoxie		Houston, Texas.

J

Jacksonville, North-Western & S. E.	E. S. Greenleaf		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	Robert Walker		Jacksonville, Fla.
Jeffersonville, Madison & Indianapolis		Wm. Mullins	Pittsburg, Pa.
Jefferson, Madison & Indianapolis,	Horace Scott		Louisville, Ky.
Junction & Breakwater	Wm. Groom		Lewis, Del.

K

Kansas Central	W. R. Martin		Leavenworth, Kan.
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard	J. F. Barnard	St. Joseph, Mo.
Kansas City, St. Joseph & Council Bluffs	*Geo. H. Nettleton		Kansas City, Mo.
Kansas Midland	W. W. Fagan.		Topeka, Kan.
Kansas Pacific	O. S. Lyford		Kansas City, Mo.
Kansas Pacific	O. S. Lyford	J. L. Woods	St. Louis, Mo.
Kaw Valley Division	O. H. Dorrance		Lawrence, Kansas.
Smoky Hill Division	A. B. Garner		Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col.
Kentucky Central	G. H. Pendleton.	Geo. P. Bowler	Covington, Ky.
Keokuk & Des Moines Valley	Geo. H. Griggs	G. E Kilbourne	Keokuk, Iowa.
Knox & Lincoln	C. A. Coombs	Oliver Morse	Bath, Maine.

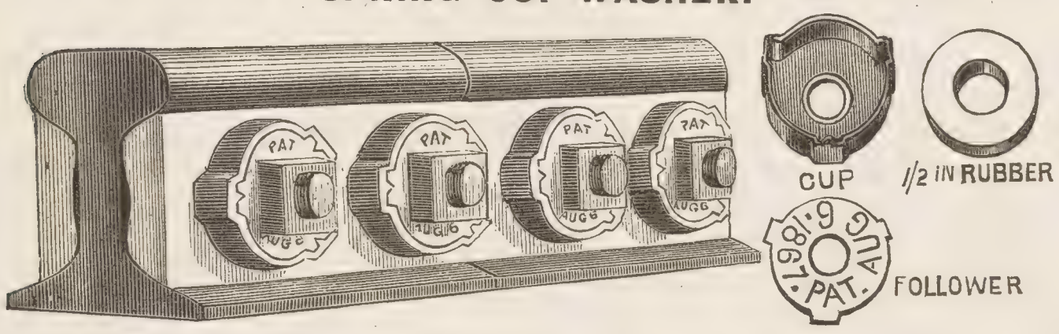
Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
L			
Lackawanna & Bloomsburg	D. T. Bound		Kingston, Pa.
Lackawanna & Bloomsburg	G. W. B. Cushing		New-York City.
Lake Erie & Louisville	I. H. Burgoon		Fremont, Ohio.
Lake Ontario Shore	George Bennett		Oswego, N. Y.
Lake Superior & Mississippi	G. H. Smith		St. Paul, Minn.
Lake Shore & Michigan Southern	Charles Paine	A. C. Armstrong	Cleveland, Ohio.
Kalamazoo Division	William Wheaton		Kalamazoo, Mich.
Detroit Division			
Lansing Division			
Leavenworth, Lawrence & Galveston	B. S. Henning	Allan Bourne	Lawrence, Kan.
Leavenworth, Lawrence & Galveston	*Geo. H. Nettleton		Kansas City, Mo.
Lawrence & South-Western	R. B. Gemmell	R. B. Gemmell	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
		L. Chamberlin	Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa.
Mahony Division	James I. Blakslee		Mauch Chunk, Pa.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	T. Hartman		Little Rock, Ark.
Logansport, Crawfordsville & S. W.	F. N. Finney		Terre Haute, Ind
Long Island	L. D. Morford	Oliver Charlick	Hunter's Point, L.
Louisville & Nashville & G. Southern	Albert Fink	G. C. Breed	Louisville, Ky.
Clarksville Division	Jas. Montgomery		Bowling Green, Ky.
Memphis Division	J. T. Flynn		Memphis, Tenn.
Nashville & Decatur Division	D. F. Whitcomb		Nashville, Tenn.
So. & North Ala. Division	Robert Meek		Birmingham, Ala.
Louisville, Cin. & Lexington	J. McLeod	Wm. Mahl	Louisville, Ky.
Louisville, New-Albany & Chicago	John L. Day	J. R. Parker	New-Albany, Ind.
Louisville, Paducah & Southwestern	D. F. Whitcomb	D. F. Whitcomb	Louisville, Ky.
M			
Macon & Brunswick	J. W. Gun		Macon, Ga.
Macon & Western	Capt. G. I. Foreacre		Atlanta, Ga.
Maine Central	L. L. Lincoln	G. A. Phillips	Augusta, Me.
Androscoggin Division	A. Brown		Lewiston, Me.
Manchester & Lawrence	H. E. Chamberlin		Concord, N. H.
Marietta & Cincinnati	W. W. Peabody	S. L. Campbell	Cincinnati, Ohio.
Marietta, Pittsburg & Cleveland	Jas. McArthur	R. B. Hoover	Marietta, Ohio.
Marquette, Houghton & Ontonagon	*Samuel Schoch	S. Schoch	Marquette, Mich
Maryland & Delaware	J. L. Caldwell	J. L. Caldwell	Easton, Md.
Memphis, Carthage & North-Western	E. H. Brown		Carthage, Mo.
Memphis & Little Rock	T. S. Tate, Jr.	J. D. Darden	Memphis, Tenn.
Memphis & Charleston	W. J. Ross	J. B. Galloway	Memphis, Tenn.
Michigan Central	W. B. Strong		Chicago. Ill.
Michigan Central	‡J. R. Ledyard	John Newell	Detroit, Mich.
Grand River Valley Division	C. B. Bush		Grand Rapids, Mich.
Jackson, Lansing & Saginaw Div.	C. B. Bush		Saginaw City, Mich.
Michigan Lake Shore	Chas. E. Gorham		Fort Wayne, Ind.
Michigan Lake Shore	P. S. O'Rourke		Monteith, Mich.
Midland Railway of Canada	H. G. Taylor		Port Hope, Ont.
Midland Pacific	J. N. Converse	M. A. Showers	Nebraska City, Neb.
Milwaukee, Lake Shore & Western	H. G. H. Reed		Milwaukee, Wis.
Western Division	J. S. Buck		Appleton, Wis.
Mineral Point	G. W. Cobb	G. W. Cobb	Mineral Point, Wis.
Mineral Range	J. H. Macdonald		Hancock, Mich
Mississippi & Tennessee	M. Burke	M. Burke	Memphis, Tenn.
Mississippi Valley & Western	Guy Wells		Quincy, Ill.
Missouri, Iowa & Nebraska	Col. Henry Hill		Warsaw, Ill.
Missouri, Kansas & Texas	C. H. Chappel		Sedalia, Mo.
Missouri, Kansas & Texas	*R. S. Stevens	G. M. Babcock	Sedalia, Mo.
Cherokee Division	L. H. Sheldon		Parsons, Kansas.
Choctaw Division	S. G. Eddy		Dennison, Texss.
Missouri Division	J. J. Frey		Sedalia, Mo.
Sedalia Division	J. J. Frey		Sedalia. Mo.
Neosho Division	L. H. Sheldon		Parsons, Kansas.
Osage Divsion	C. M. Sheafe		Holden, Mo.
Missouri Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Missouri River, Fort Scott & Gulf	B. S. Henning	Allan Bourne	Kansas City, Mo.
Missouri River, Fort Scott & Gulf	*Geo. H. Nettleton		Kansas City, Mo.
Mobile & Ohio	A. L. Rives	C. E. Rushing	Mobile, Ala.
Alabama Division	Cecil Fleming		Mobile, Ala.
Mississippi Division	E. S. Hosford		Macon, Miss.
Tenn. & Ky. Divis on	G. W. Robertson		Jackson, Tenn.
Mobile & Girard	W. L. Clark		Columbus, Ga.
Mobile & Montgomery	G. Jordon	G. Jordon	Montgomery, Ala.
Montgomery & Eufaula	B. Dunham	B. Dunham	Montgomery, Ala.
Morgan's Louisiana & Texas		C. A. Whitney & Co.	New-Orleans, La
N			
Nashville, Chattanooga & St. Louis	J. W. Thomas	L. P. Barnes	Nashville, Tenn.
Naugatuck	G. W. Beach		Bridgeport, Ct.
New-Brunswick & Canada		Tho. H. Street	St. Andrews, N. B.
New-Brunswick & Canada	John Stewart		St. Stephens, N. B.
New-Bedford & Taunton	Warren Ladd		New-Bedford, Mass.
New-Haven & Derby	E. S. Quintard		New-Haven, Ct.
New-Haven & Northampton	C. N. Yeamans	C. N. Yeamans	New-Haven, Ct.
New-Haven, Middletown & Willimantic	W. A. Waterbury	W. A. Waterbury	Middletown, Ct
New-Jersey & New-York	W. D. Beasley		Jersey City, N. J.
New-Jersey Midland	W. E. Lewis		Wortendyke, N. J.
New-Jersey Southern	*W. S. Sneden		Long Branch, N. J
New-Orleans & Selma	T. H. Du Puy		Selma, Ala.
New-Orleans, St. Louis & Chicago	*E. D. Frost	S. H. Edgar, V. P.	New-Orleans, La.
New-Orleans & Mobile	D. B. Robinson		Mobile, Ala.
New-York & Harlem	Chas. M. Bissell	R. C. Moore	New-York, N. Y.
New-York, New-Haven & Hartford	E. M. Reed	R. N. Dowd	New Haven, Ct.
N. Y. & N. H. Division	John T. Moody		New-York, N. Y.
Hartford Division	C. S. Davidson		Hartford, Ct.
Shore Line Division	W. H. Stephenson		New-Haven, Ct.
New-York, Boston & Montreal	C. L. Kimball		Dutchess Jn., N. Y
New-York Central & Hudson River	J. Tillinghast		Albany, N. Y.
New-York Central & Hudson River		C. V. DeForest	New-York.
Eastern Division	Zenas C. Priest		Utica, N. Y.
Syracuse & Rochester Division	G. H. Burrows		Syracuse, N. Y.
Buffalo & Rochester Division	M. W. Torrence		Buffalo, N. Y.
New-York & New-England	H. A. G. Pomeroy		Boston, Mass.
Worcester Division	P. St. M. Andrews		Worcester, Mass.
New-York & Oswego Midland			New-York, N. Y.
New-Jersey Division	G. W. N. Custis		Jersey City, N. J.
Middle Division	H. M. Flint		Middletown, N. Y.
Western Division			Oswego, N. Y.
New-York, King ston & Syracuse	H. P. Breed		Rondout, N. Y.
New-York, Providence & Boston	A. S. Matthews	A. S. Matthews	Stonington, Ct.
New Brunswick	Tho. Hoben	W. R. Logan	Fredericton, N.B.
Northern Pacific	*C. W. Mead	E. F. Williams	St. Paul, Minn.
Minnesota Division	J. H. Sullivan		Brainerd, Minn.
Northern Pacific Division	*J. W. Sprague		Kalama, W. T.
Lake Superior & Miss. Division	George H. Smith		St. Paul, Minn.
North-Louisiana & Texas	W. R. Gordon		Monroe, La.
North-Pennsylvania	S. W. Roberts	F. A. Cornby	Philadelphia, Pa.
Northern Canada	†F. W. Cumberland		Toronto, Can.
Northern Central		A. W. Sumner	Baltimore, Md.
Northern Central	*Frank Thomson		Philadelphia, Pa.
Northern (New-Hampshire)	George E. Todd		Concord, N. H.
North-Eastern (South-Carolina)	F. K. Huger		Charleston, S. C.
O			
Ohio & Mississippi	E. L. Ryder		Cincinnati, Ohio.
Oil Creek & Alleghany River	C. J. Hepburn		Oil City, Pa.
Old Colony	J. R. Kendrick		Boston, Mass.
Omaha & North-Western	J. E. House		Omaha, Neb.
Oregon & California	J. Brandt, Jr.	G. W. Weidler	Portland, Oregon.
P			
Paducah & Memphis	J. W. Wilber		Paducah, Ky.
Painesville & Youngstown	G. R Crane		Painesville, Ohio.
Paris & Danville	B. F. Matthius		Danville, Ill.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Pennsylvania	G. Clinton Gardner		Altoona, Pa.
Pennsylvania	*Frank Thomson	Enoch Lewis	Philadelphia, Pa.
Philadelphia Division	W. F. Lockard		Philadelphia, Pa.
Middle Division	J. N. McCrea		Harrisburg, Pa.
Pittsburg Division	Rob't Pitcairn		Pittsburg, Pa.
Tyrone Division	S. S. Blair		Tyrone Pa.
Bedford Division	S. M. Prevost		Bedford, Pa.
West Pennsylvania Division	J. McCreighton		Allegheny City, Pa.
Pennsylvania & New-York Canal	A. Mitchell		Wilkesbarre, Pa.
Pensacola & Louisville	C. S. Williams		Pensacola, Fla.
Peoria & Rock Island	John R. Hilliard		Peoria, Ill.
Peoria & Rock Island	*W. R. Hamilton	W. R. Hamilton	Peoria, Ill.
Peoria, Pekin & Jacksonville	James F. Kelsey		Pekin, Ill.
Petersburg	R. A. Bacon	W. P. Taylor	Petersburg, Va.
Philadelphia & Reading	J. E. Wootten	W. S. Wilson	Reading, Pa.
Catawissa & Williamsport Br'ch	George Webb		Pittsburg, Pa.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Lebanon & Tremont	H. W. Tracy		Pine Grove, Pa.
Philadelphia and Baltimore Central	Henry Wood	Henry Wood	Philadelphia, Pa.
Philadelphia & Erie	W. A. Baldwin		Williamsport, Pa.
Philadelphia & Erie		Enoch Lewis	Philadelphia, Pa.
Western Division	J. W. Reynolds		Erie, Pa.
Middle Division	Edmund L. Tyler		Renovo, Pa.
Eastern Division	Thomas Gucker		Williamsport, Pa.
Philadelphia, Wilmington & Baltimore	H. F. Kenney		Philadelphia, Pa.
Pithole Valley	J. T. Odell		Pithole City, Pa.
Pittsburg, Cincinnati & St. Louis	S. M. Felton, Jr.	Wm. Mullins	Pittsburg, Pa.
Pittsburg & Cin. Division	S. M. Felton, Jr		Pittsburg, Pa.
Little Miami Division	J. D. Ellison		Cincinnati, Ohio.
Indianapolis & C. Division	D. W. Caldwell		Columbus, Ohio.
Pittsburg, Washington & Baltimore	E. K. Hindman		Connellsville, Pa.
Pittsburg, Ft. Wayne & Chicago	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Eastern Division	George Webb		Pittsburg, Pa.
Western Division	C. D. Gorham		Fort Wayne, Ind.
Port Royal	R. G. Fleming		Augusta, Ga.
Portland & Ogdensburg	J. Hamilton	John E. Donnell	Portland, Maine.
Portland & Rochester	W. H. Turner	W. H. Turner	Portland, Maine.
Portland, Saco & Portsmouth	Francis Chase		Portland, Maine.
Portsmouth, Great Falls & Conway	J. W. Sanborn		Portsmouth, N. H.
Portsmouth	H. E. Chamberliu		Concord, N. H.
Poughkeepsie & Eastern	J. A. Perkins	A. W. Cable	Poughkeepsie, N Y
Providence & Worcester	W. D. Hilton	W. D. Hilton	Providence, R. I.
Providence, Warren & B	Waterman Stone		Providence, R. I.
Q			
Quincy, Alton & St. Louis	N. J. T. Dana	N. J. T. Dana	Quincy, Ill.
Quincy, Missouri & Pacific	J. R. Buchanan		Quincy, Ill.
R			
Raleigh & Gaston	A. B. Andrews	A. B. Andrews	Raleigh, N. C.
Rensselaer & Saratoga	H. A. Fonda		Albany, N. Y.
Richmond, York River & Chesapeake	E. F. Folger	Hugh Graham	Richmond, Va.
Richmond & Danville	T. M. R. Talcott		Richmond, Va.
Richmond, Fred. & Potomac	E. T. D. Myers	T. L. Courtney	Richmond, Va.
Richmond & Petersburg	Augustus Shaw		Richmond, Va.
Rockford, Rock Island & St. Louis	W. H. Ferry, Receiver		Rock Island, Ill.
Northern Division	Henry Looseley		Rock Island, Ill.
Southern Division	Geo. L. Walker		Beardstown, Ill.
Rome, Watertown & Ogdensburg	J. W. Moak		Watertown, N. Y.
S			
St. Lawrence & Ottawa	R. Luttreil		Prescott, Can.
St. Joseph & Denver City	*L. D. Tuthill		St. Joseph, Mo.
St. Paul & Pacific	E. Q. Sewell	E. C. Becker	St. Paul, Minn.
St. Paul & Sioux City	J. F. Lincoln	J. F. Lincoln	St. Paul, Minn.
St. Louis, Alton & Terre Haute	W. G. Broughton		St Louis, Mo.
St. Louis, Iron Mountain & Southern	Arthur W. Soper	W. S. Cuddy	St. Louis, Mo.
St. Louis, Iron Mountain & Southern	*Tho. McKissock		St. Louis, Mo.
St. Louis & South-Eastern	*E. F. Winslow	C. O. Wood	St. Louis, Mo.
St. Louis Division	George S. Winslow		Mt. Vernon, Ill.
Nashville Division	R. H. G. Minty		Nashville, Tenn.
St. Louis, Kansas City & Northern	W. R. Arthur	R. W. Green	St. Louis, Mo.
St Louis Division	W. H. Vaughan		St. Louis, Mo.
Western Division	C. L. Dunham		Kansas City, Mo.
St. Louis, Vandalia, Terre Haute & Ind.	John E. Simpson		Indianapolis, Ind.
St. Louis, Vandalia, Terre Haute & Ind.	Chas. R. Peddle		Terre Haute, Ind.
Sacramento Valley & P. & S. V	F. A. Bishop		Sacramento, Cal.
Saginaw Valley & St. Louis	J. B. Gillett	J. B. Gillett	Saginaw, Mich.
San Francisco & Northern Pacific	A. A. Bean	F. H. Gudes	Petaluma, Cal.
San Rafael & San Quentin	David Nye		San Rafael, Cal.
Savannah & Charleston	C. S. Gadsden		Charleston, S. C.
Seaboard & Roanoke		E. G. Ghio	Baltimore, Md.
Selma, Marion & Memphis	E. W. Rucker	E. W. Rucker	Marion, Ala.
Selma, Rome & Dalton	M. Stanton		Patona, Ala.
Sheboygan & Fond du Lac	L. A. Emerson	L. A. Emerson	Fond du Lac, Wis.
Shenango & Allegheny	A. L. Dunbar		Meadville, Pa.
Sioux City & Pacific	L. Burnett	L. Burnett	Missouri Valley, Ia.
Sodus Point & Southern	H. Van Vleck		Sodus Point, N. Y.
South-Shore	J. R. Kendrick		Boston, Mass.
South Carolina	S. S. Solomon	A. Mitchell	Charleston, S. C.
Southern Central	Jas. G. Knapp		Auburn, N. Y.
Southern, of Long Island	I. D. Barton		Hunter's Point, L.I.
Southern, of Long Island		A. E. Godeffroy	New-York City.
Southern Minnesota	W. C. Van Horne		Wells, Minn.
Southern Pacific of California	A. N. Towne		Sacramento, Cal.
Southwestern of Georgia	Virgil Powers		Macon, Ga.
Spartanburg & Union	W. W. Davies		Spartanburg, S. C.
Springfield, Athol & Northeastern	John W. Phelps		Springfield, Mass.
Springfield & North-Western	*A. J. Ware		Pekin, Ill.
Springfield, Illinois & South-Eastern	*C. A. Beecher		Springfield, Ill.
Staten Island	J. W. Wilbur		New-York, N. Y.
Stockton & Ione	W. G. Miller		Stockton, Cal.
Stonington & Providence	A. S. Mathews	A. S. Mathews	Stonington, Ct.
Sullivan & Erie	Wm. Stevenson		Towanda, Pa.
Summit County	W. M. Riter		Coalville, Utah.
Syracuse Northern	J. W. Moak		Watertown, N. Y.
Syracuse, Binghamton & New-York	T. Voorhees	G. W. B. Cushing	Syracuse, N. Y.
T			
Tennessee & Pacific	George Maney		Nashville, Tenn.
Terre Haute & Indianapolis	J. E. Simpson		Indianapolis, Ind.
Terre Haute & Indianapolis		C. R. Peddle	Terre Haute, Ind.
Texas & New-Orleans	R. B. Baer		Houston. Texas.
Texas & Pacific	Geo. H. Noble		Marshall, Texas
Tioga	L. H. Shattuck		Blossburg, Pa.
Toledo, Peoria and Warsaw	W. H. Cruger		Peoria, Ill.
Toledo, Peoria & Warsaw		Oran Ott	Chicago, Ill.
Western Division	David K. Smith		Peoria, Ill.
Western Division	William E. Dorwin		Warsaw, Ill.
Toledo, Wabash & Western	Robert Andrews	J. T. Sterling	Toledo, Ohio.
Eastern Division	K. H. Wade		Lafayette, Ind.
Western Division	C. W. Bradley		Springfield, Ill.
Toledo, Canada Southern & Detroit	D. Edwards		Toledo, Ohio.
Troy & Boston	C. W. Moseley		Troy, N. Y.
Toronto, Grey & Bruce	N. Weatherston	W. Watson	Toronto, Can.
Toronto & Nipissing	J. C. Bailey		Toronto.
Tuckerton	J. Naramore		Tuckerton, N. J.
U			
Union Pacific	S. H. H. Clarke	S. H. H. Clarke	Omaha. Neb.
Mountain Division	S. J. Nichols		Cheyenne, Wyom'g
Laramie Division	S. T. Shankland		Laramie, Wyoming
Western Division	O. H. Earll		Evanston, Wyoming
Utah Central & Southern	John Sharp	S. H. Hill	Salt Lake City.
Utica & Black River	J. F. Maynard		Utica, N. Y.
Utica, Ithaca, & Elmira	H. P. Goodrich		Ithaca, N. Y.

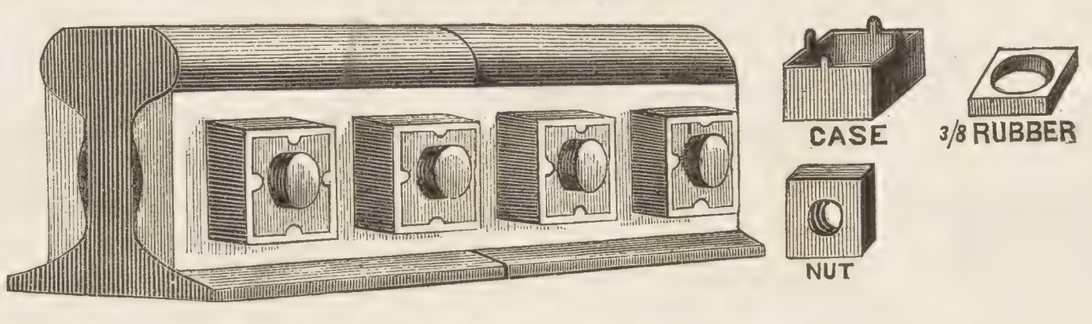
Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
V			
Vermont & Mass. & Troy & G	O. T. Ruggles	O. T. Ruggles	Fitchburg, Mass.
Vermont Central	J. W. Hobart		St. Albans, Vt.
Western Division	John Schrier		Ogdensburg, N. Y.
Central & Southern Division	Ambrose Arnold		St. Albans, Vt.
Northern & Eastern Division	G. L. Stone	" "	"
Rutland Division	J. Burdett		Rutland, Vt.
Harlem Extension Division	J. Burdett		Rutland, Vt
New-London Northern	G. W. Bentley		New-London, Ct
Vicksburg & Meridian	E. F. Raworth		Vicksburg, Miss.
Virginia & Truckee	C. M. Yerrington	C. P. Mason	Carson, Nevada.
W			
Washington & Ohio	R. H. Havener	Lewis McKenzie	Alexandria, Va.
Welland	William Pay		St. Catherine, Ont.
Westchester & Philadelphia	Henry K. Smith	J. J. Bryant	Philadelphia, Pa.
West-Wisconsin	W. G. Swan		Hudson, Wis.
West Jersey	W. J. Sewell		Camden, N. J.
Western of North-Carolina	John M. Rose		Fayetteville, N. C.
Western & Atlantic	Wm. McRae		Atlanta, Ga.
Western Maryland	*J. M. Hood		Baltimore, Md.
Western Union	D. A. Olin		Racine, Wis.
White Water Valley	H. M. Britton	H. M. Britton	Cincinnati, Ohio.
Wilmington & Western	David Connell		Wilmington, Del.
Wilmington, Columbia & Augusta	James Anderson	James Anderson	Wilmington, N. C.
Wilmington & Weldon	J. F. Devine		Atlanta, Ga.
Wilmington & Reading	E. Collings	C. Stoltz	Coatesville, Pa.
Winona & St. Peter	S. Sanborn		Madison, Wis.
Winona & St. Peter		R. W. Hamer	Chicago, Ill.
Wisconsin Central	E. B. Phillips		Milwaukee, Wis.
Worcester & Nashua	C. S. Turner	C. S. Turner.	Worcester, Mass.

PRATT'S PATENT COMPENSATING FISH-PLATE JOINTS.

"SPRING CUP-WASHER."



"SPRING NUT."



Track Bolts and Nuts are constantly subjected to a vibration and jar. One large item of expense is for wrench-work and replacement of bolts and nuts already off.

Most of the contrivances for removing this trouble are failures. They do not remove the cause of the trouble. This can only be done by some elastic material, which will absorb the vibration and prevent its reaching the nuts. Experience proves that permanent elasticity can not be obtained by using wood, which is perishable, or steel, which can not be made of uniform temper. In our inventions, the elastic packing of rubber between the nut and the plate absorbs the jar or vibration, insulates the nut, and by removing the cause of the trouble removes the trouble itself. Among its advantages are these:

1st. It saves the expense of wrench-work and loss of nuts.

2d. The rubber absorbs the blow given by the wheels at the joint, in such manner as to prevent fracture of rails at the joint, and accidents resulting therefrom.

3d. The track is made noiseless.

4th. Rails are saved from pounding out at the ends, and the thread of the bolts and nuts from stripping.

The practical value of these inventions is more fully demonstrated by the two million joints now long in use.

Manufactured and Sold by

THE PRATT MANUFACTURING COMPANY,

NO. 71 BROADWAY, NEW-YORK,

Manufacturers and Dealers in all kinds of RAILWAY TRACK SUPPLIES; also, New-York Agents for the Tuttle & Whittemore Co., Naugatuck Conn., Manufacturers of REFINED MALLEABLE IRON CASTINGS, from Patterns to order.

Special attention given to MALLEABLE IRON CASTINGS for Railroad Car construction.

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LOCOMOTIVE HEAD LIGHTS AND STEAM GAUGES,

CAR SPRINGS OF EVERY DESCRIPTION,

INCLUDING THE "COMBINATION ELLIPTIC SPRING."

Special attention is called to our Patent **CLIFF ELLIPTIC SPRINGS** for Freight and Passenger service. See advertisement, page ii.

Steel Rails, Locomotive and Car Tires, Elliptic Springs and Cast Steel of all descriptions.

JOHN C. WYMAN, General Manager.

52 Fifth Avenue, Chicago.

720 North Second Street, St. Louis.

32 Warren St.,

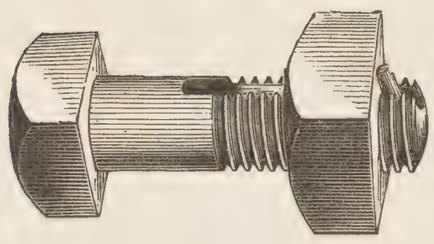
NEW-YORK

Wm. Courtenay, President. Chas. F. Cobb, Secretary.

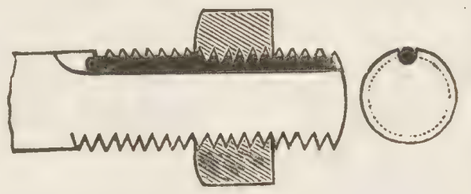
The Lock-Nut and Bolt Co., of New-York,

Office, No. 17 DEY STREET, New-York.

Manufacturers of all kinds of BOLTS, for FISH-PLATES, CARS, BRIDGES, MACHINERY, CARRIAGES, &c., with the



"Cumming Nut-lock,"
Patented
June 16, 1868,
August 23, 1870.



SECTIONS.

Unequaled for CHEAPNESS, SIMPLICITY & EFFECTIVENESS.

This simple device, as will be seen by the engravings, consists of a groove being cut in the threaded part of a screw bolt into which is placed a key of copper wire, or other soft metal; when the nut is screwed on, it cuts a thread on the key, thereby making it impossible for the key to get out until the nut is taken off. When the nut is screwed up to its place, that part of the key over which the nut has passed is riveted up against the nut with a small punch, destroying the thread on the key. The nut, therefore, can not move backward until force is used, as with a wrench.

The groove can be rapidly cut with a simple machine designed for the purpose.

Experience has proved this device absolutely reliable, and it is the cheapest of all known devices for the purpose. By its use, old bolts on which the nuts have become too slack for use can be made as good as new, making it a great saving to railroad companies and others in that item alone. It is cheaper than a check-nut.

If the bolt should become slack from shrinking of timber or other causes, *the nut will always remain firmly attached to the bolt*, and, with the wrench, can be screwed up *any distance*, and the wire riveted up any number of times, or can be taken off without injury to the nut or bolt.

This is the only method in use that locks the nut firmly to the bolt without regard to place or surroundings, all others require some attachment that holds the bolt in its position, and a washer or other attachment to keep the nut from turning.

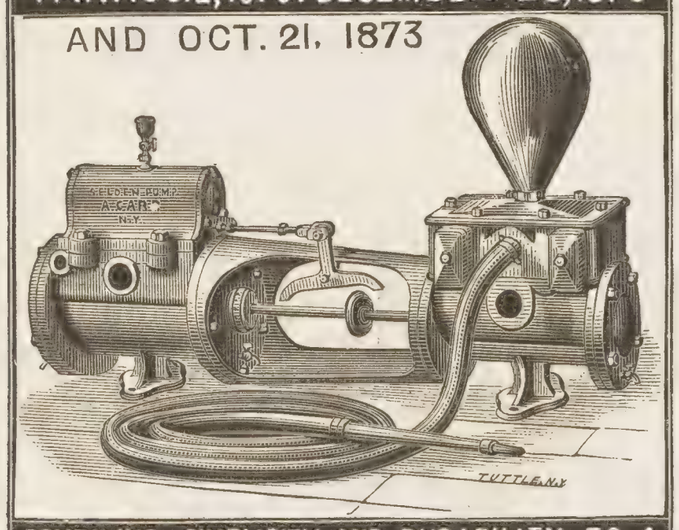
Directions for Use.—Place the copper key in the slot, pointed end out, and beveled side up, in such a position that when the nut is screwed to its place about three-eighths of an inch of the key will project beyond its outer face. Then screw the nut to its place *over the key*, allowing it to cut its own thread in the copper. Then take a narrow flat set punch, and rivet the projecting part of the key *solidly* against the outer face of the nut. To tighten the nut: screw it up, and rivet the key tighter. To remove the nut: simply apply the wrench and unscrew the nut. It will cut its own way out through the copper. The same key can be used several times, by moving it outward a few threads in the slot.

"DEAD STROKE" POWER HAMMER.

IMPROVED ADJUSTABLE CRANK PIN.
Strikes Blow Heavy or Light, Fast or Slow.
Prices Reduced Jan. 1st, 1875.
The Hull & Belden Company, Danbury, Ct.

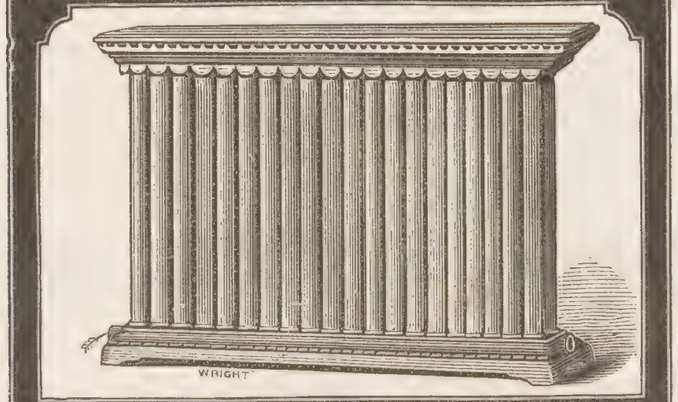
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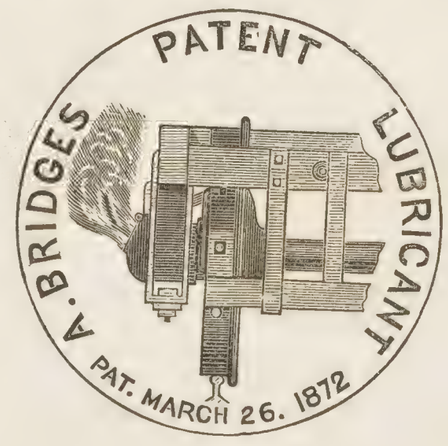
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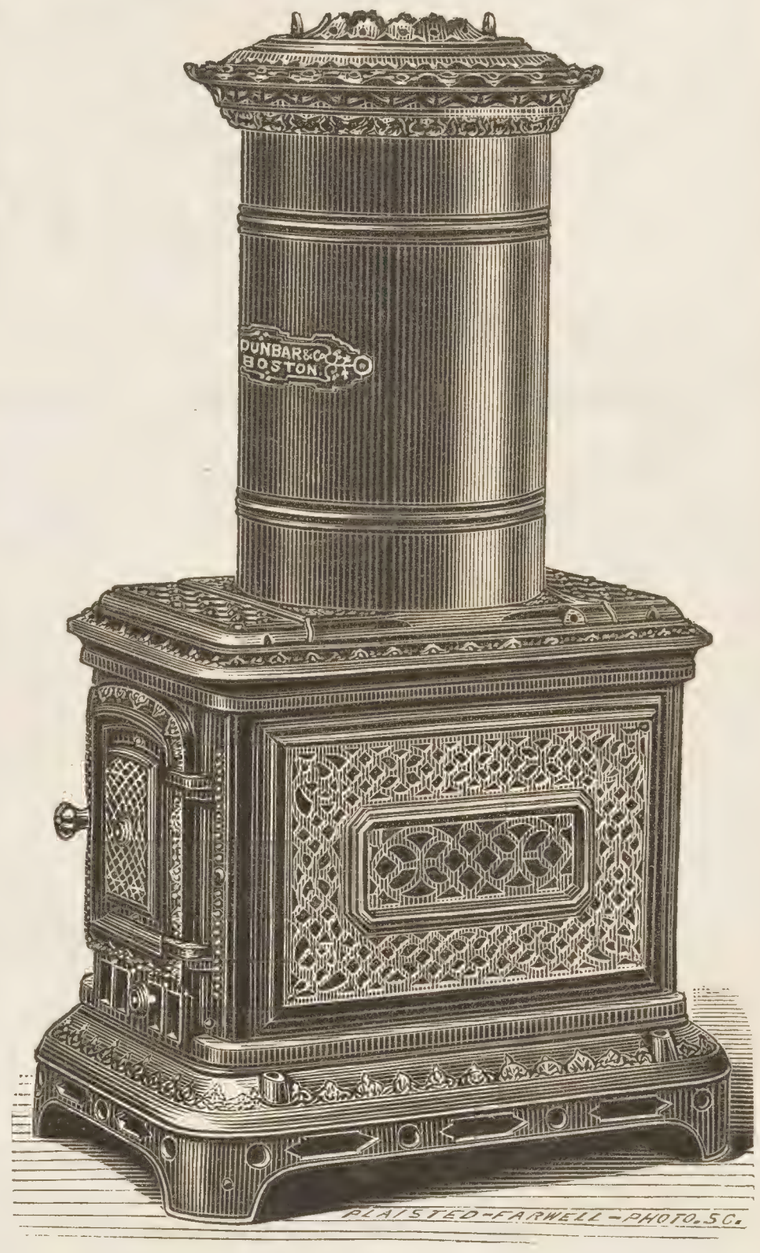
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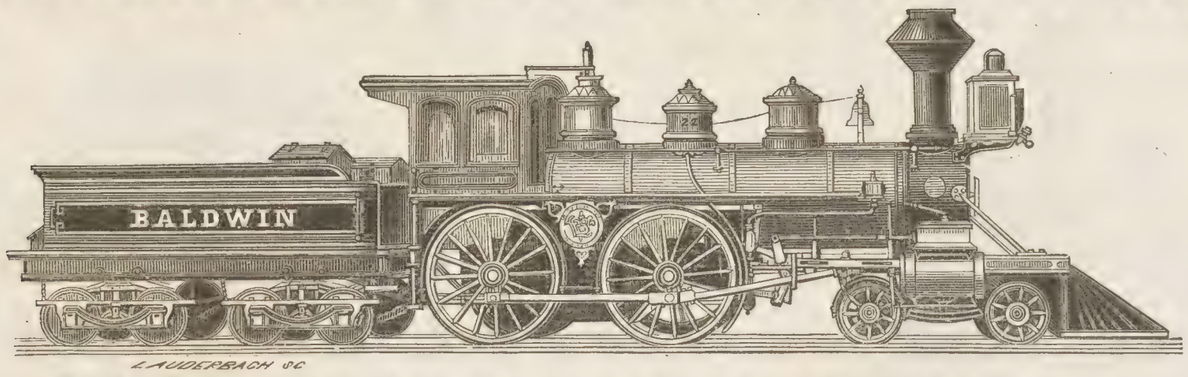
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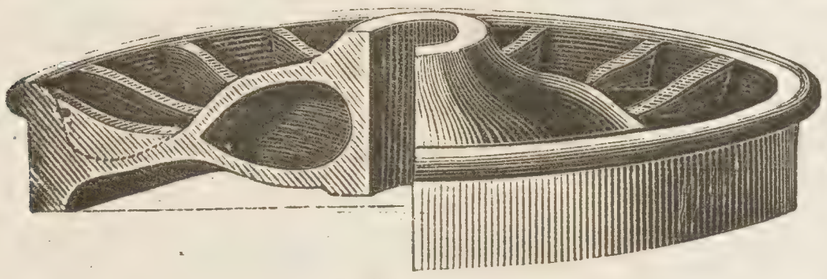
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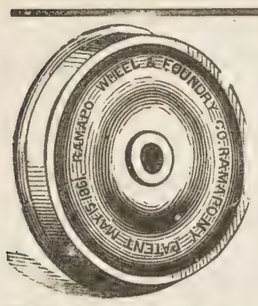
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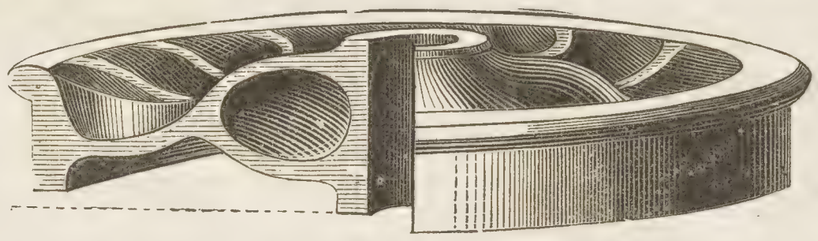
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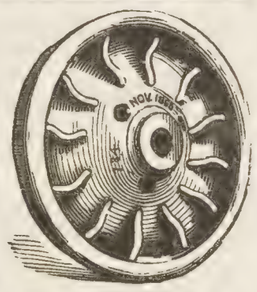
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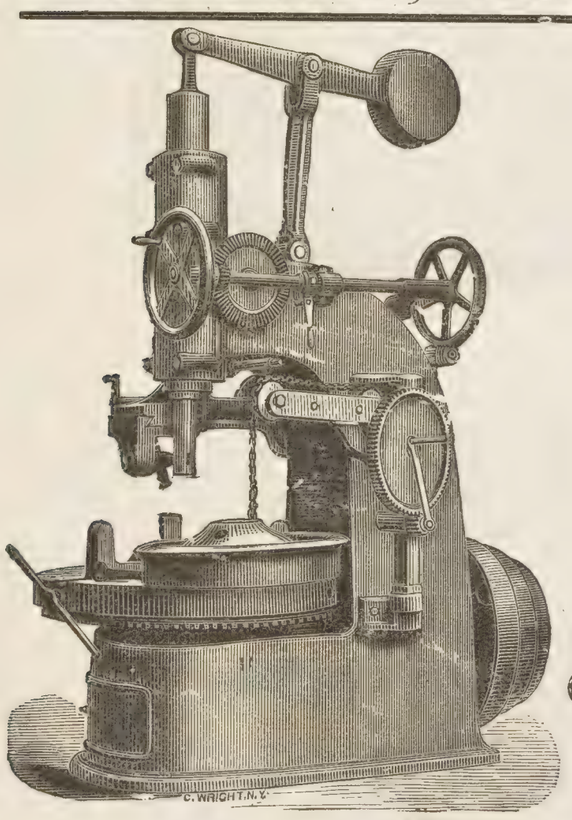
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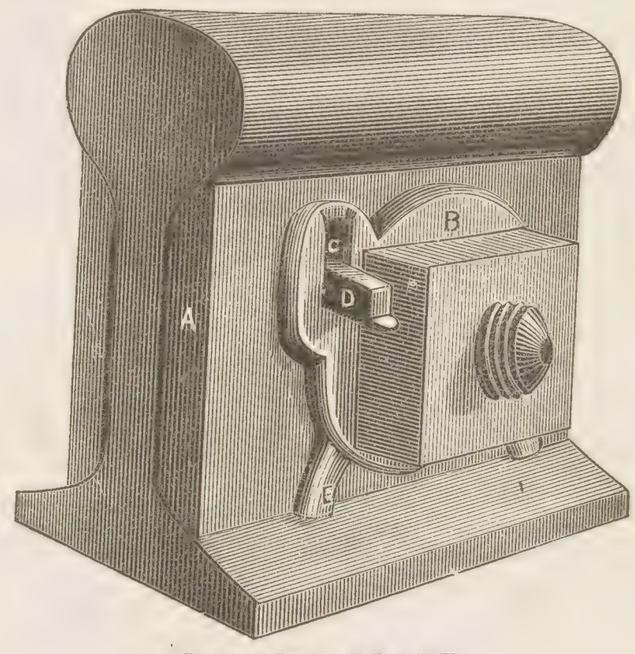
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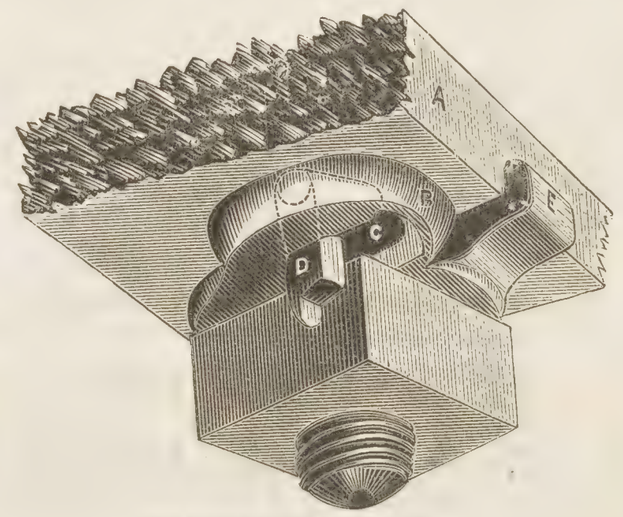
A Positive Nut-Lock, made of Malleable Iron.



For FISH PLATE.

EXPLANATION OF CUT.

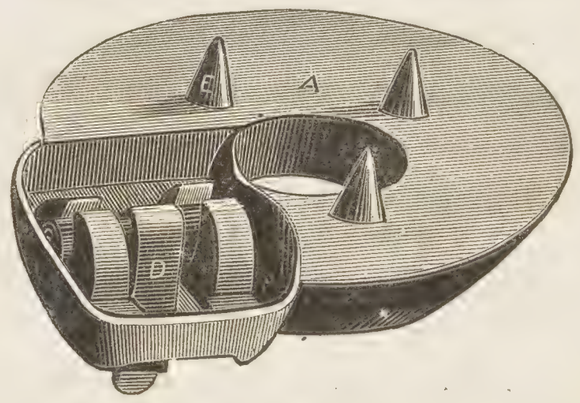
A, Fish plate. *B*, Washer, with projecting feet. *C*, Cavity into which the dog, *D*, swings, on screwing up the nut. *D*, Pivoted dog which falls by side of nut when screwed home.



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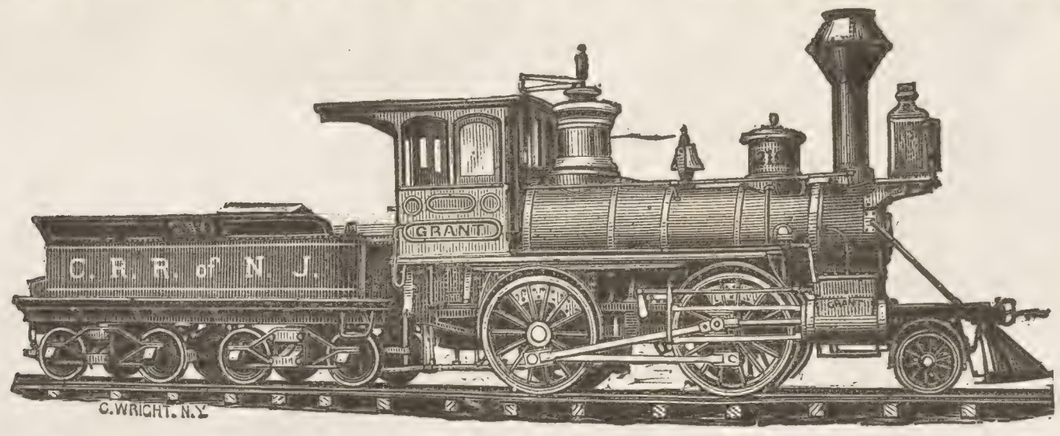
MANAGER OF

Safety Washer Manufacturing Company,

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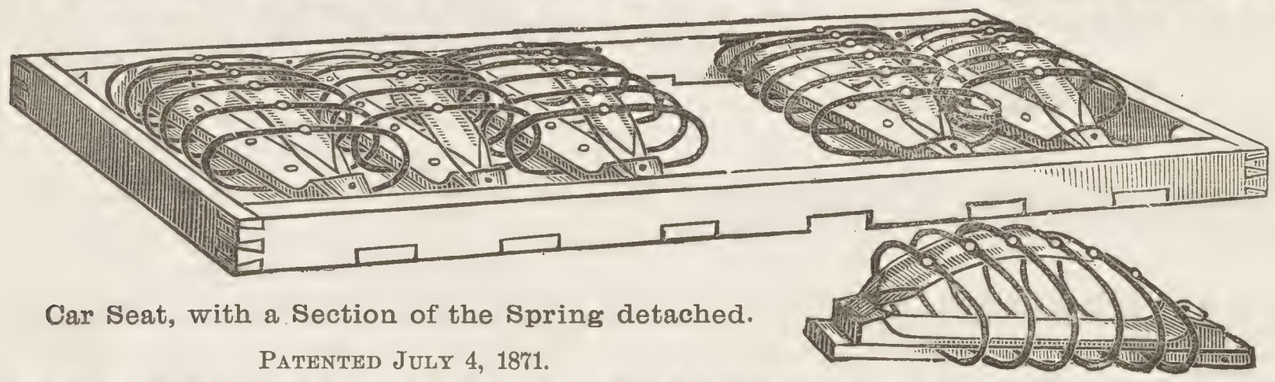
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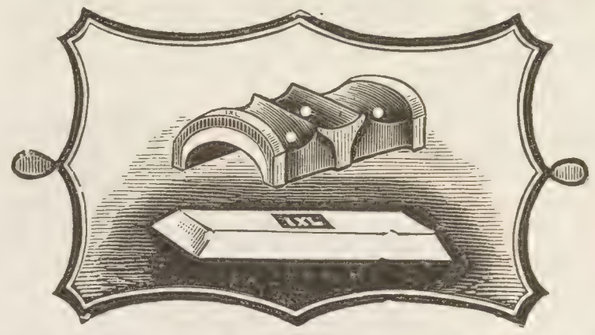
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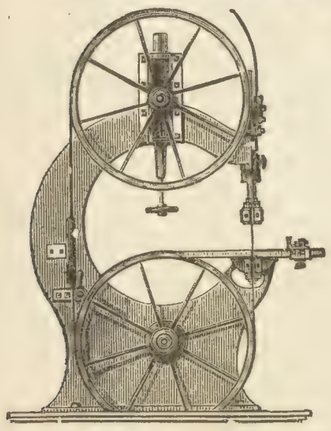
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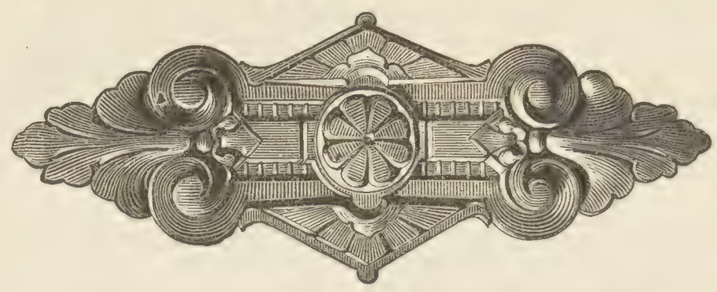
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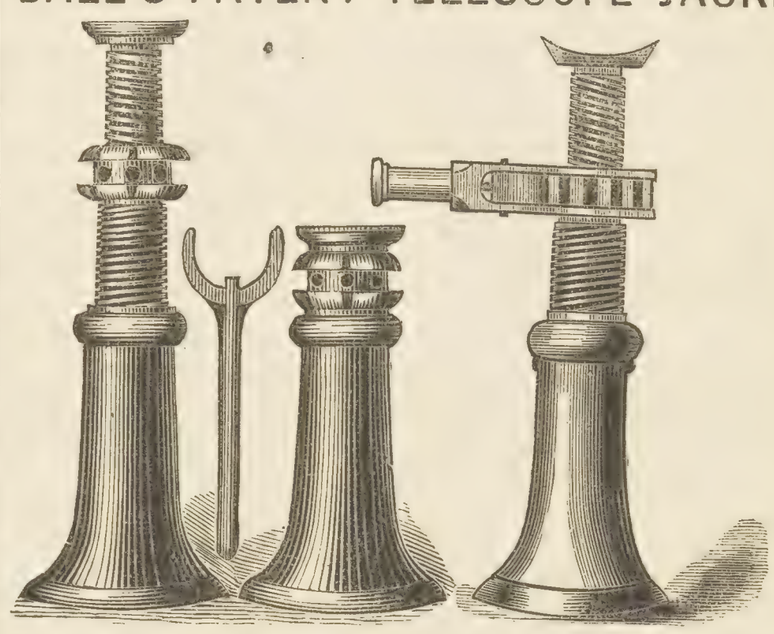
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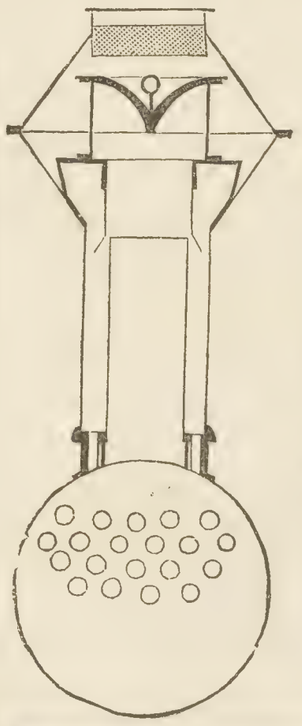
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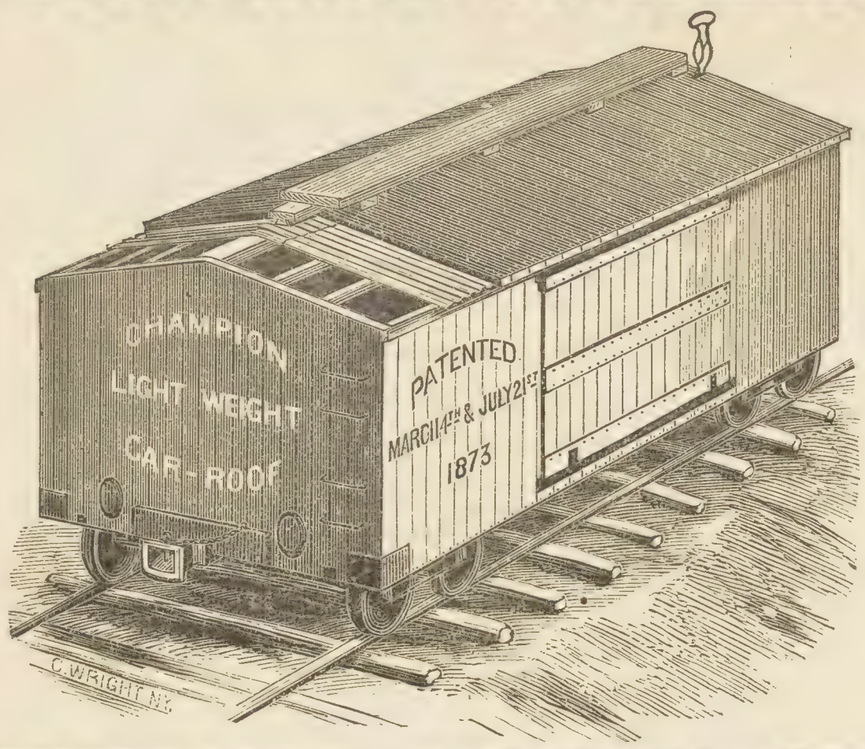
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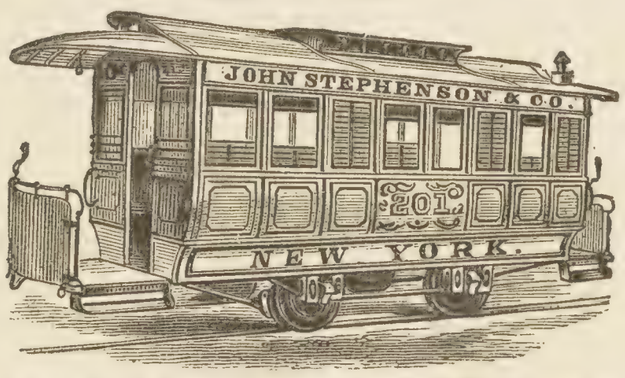
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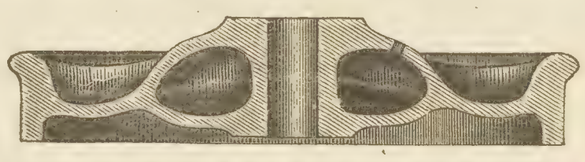
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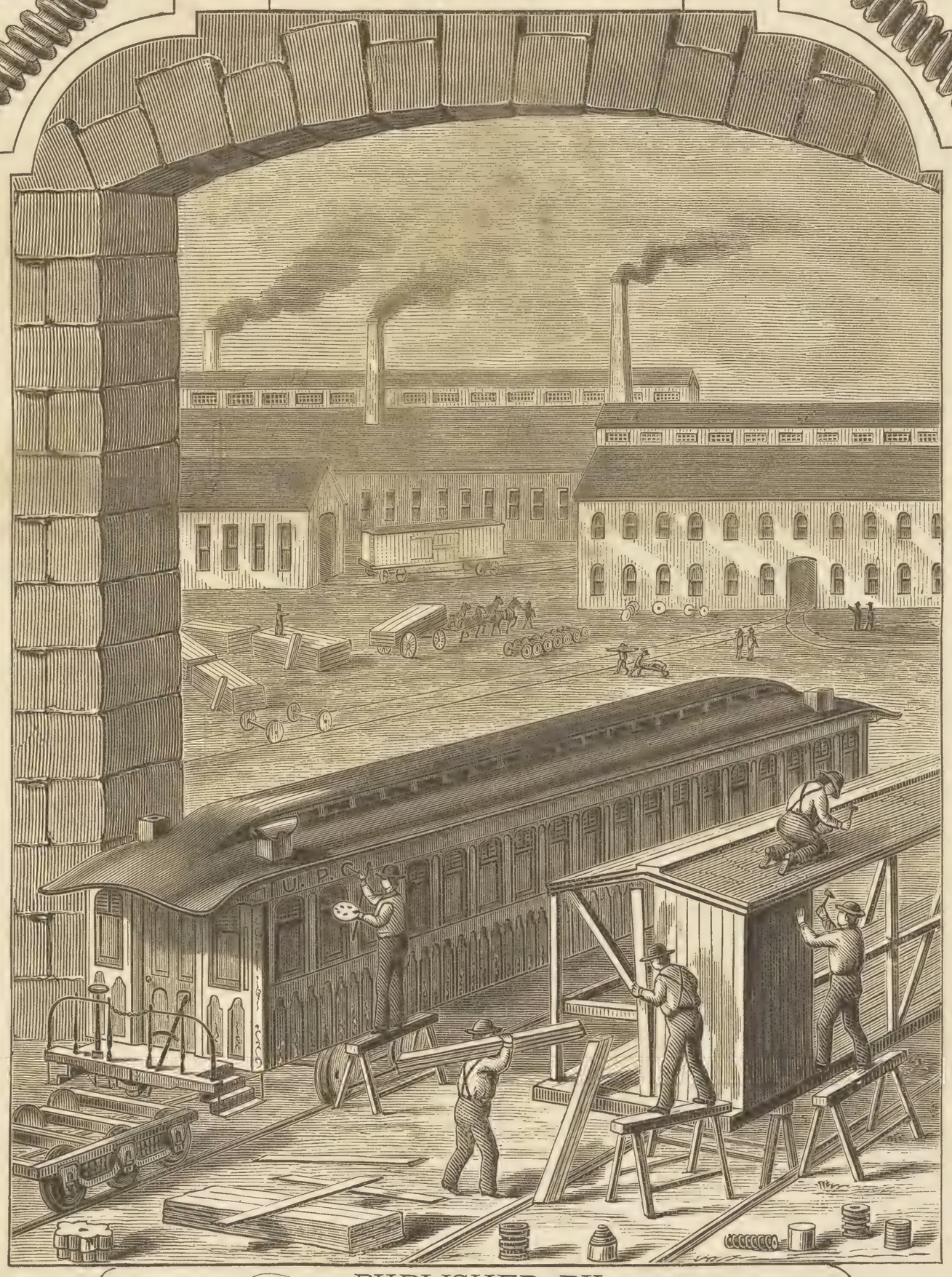
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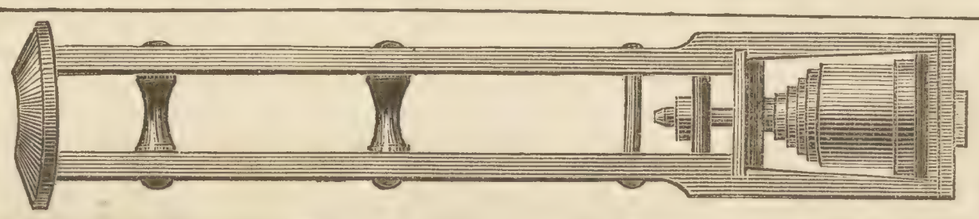
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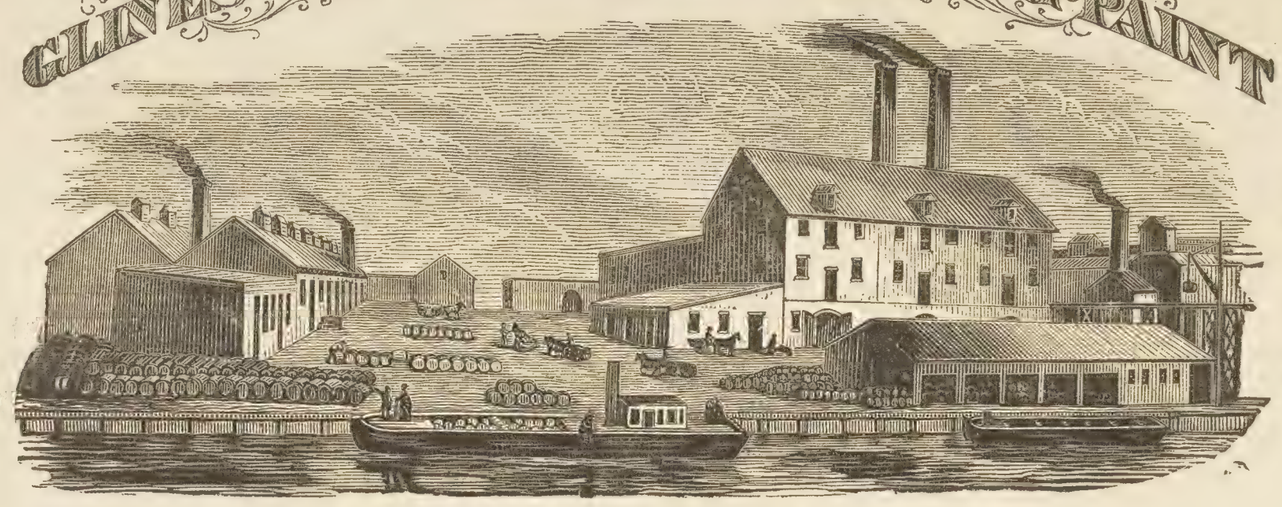
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Contains no Tar.

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STOPS ALL LEAKS.

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☞ SEND FOR TESTIMONIALS.

A roof may be covered with a very cheap shingle, and by application of this slate be made to last from twenty to twenty-five years. ***Old Roofs*** can be patched and coated, looking much better, and lasting longer than new shingles without the slate, for ***one third the cost of reshingling.*** This Paint is *practically* fire-proof against sparks or flying embers, and for tin and iron has no equal, as it expands by heat, contracts by cold, and will not corrode in the most exposed places. Roofs covered with Tar Felt can be made water-tight at a small expense. The Slate Paint is ***EXTREMELY CHEAP!***

Two gallons cover 100 square feet of shingle roof, or 600 of tin or iron, is easily applied with a brush, and ***neither cracks in winter nor runs in summer.*** On ***decayed*** shingles it fills up the holes and pores, and gives a new, substantial roof, that lasts for years. *Curled* or *warped* shingles it brings to their places and keeps them there. It fills up all holes in felt roofs and stops the leaks. As nearly all Paints that are black contain *tar*, be sure you obtain our *genuine* article, which (for shingle roofs) is ***chocolate color,*** when first applied, changing to a uniform slate color, and is to all intents and purposes *Slate.* On ***Tin Roofs*** our *red color* is usually preferred, one coat being equal to five of any ordinary paint. For BRICK WALLS our *bright* red is the only reliable Slate Paint ever introduced that will effectually *prevent* dampness from penetrating and discoloring the plaster. Our

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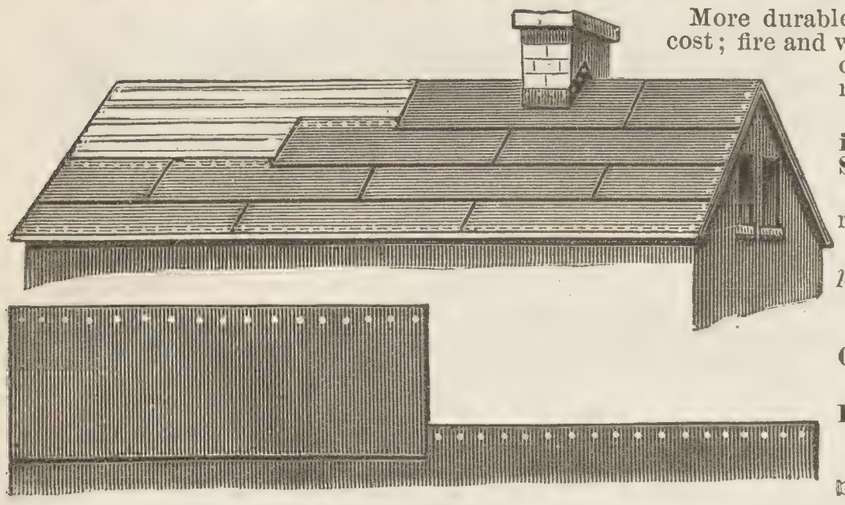
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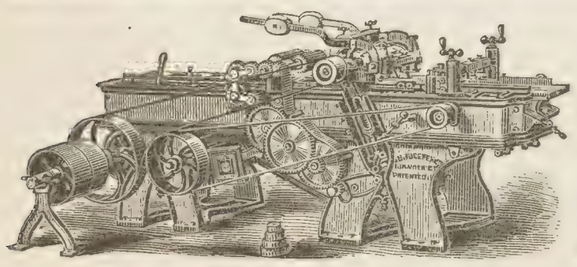
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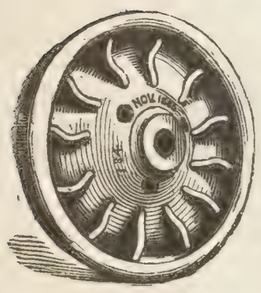
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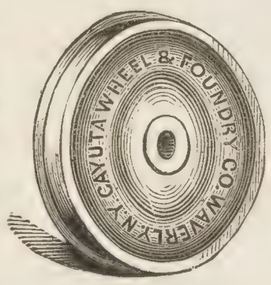
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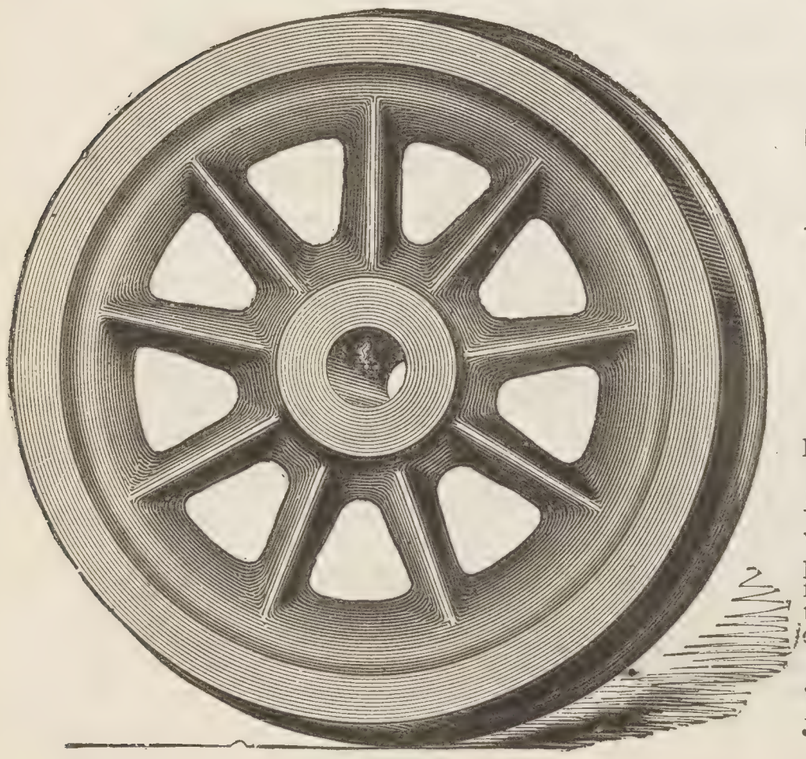
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Patent Coupling,

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First. It is self-coupling; perfectly simple; requires no pins; always sure and couples readily with any car having the ordinary draw-bar.

Second. The expense is but a trifle more than the ordinary coupling, and will be saved in pins and links alone in a very short time, there being a link always in reserve, ready for use, without liability of being lost or stolen.

Third. The saving of time is also a great consideration, as the engineer alone can couple a train of cars in much less time than with the aid of two or three men with the ordinary coupling.

Fourth. There is no going between the cars to shackle or unshackle; *it is entirely safe, always ready, always sure.* To companies desirous of testing the coupling, one or more castings will be furnished gratuitously, for trial.

The Boston and Albany Railroad Co., after a thorough trial, being satisfied of its utility, have purchased the right for their road, and we are permitted to refer to the officers and employés of the road, who have given attention to it.

For further information respecting it, address

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THE PULSOMETER,



APPLICATION TO RAILROAD WATER-STATIONS.

The above cut represents the Pulsometer in position, supplying a locomotive tender from an adjacent stream by the use of the steam from the locomotive itself. They are fitted with flexible steam connection and adjustable delivery pipes, always ready for instant use, thus doing entirely away with the expense of water tanks, pumping engines, and local engineers at watering stations on railroads. Adapted to take water from any creek, river, or well within reasonable distance and perpendicular depth from the track. Also for filling tanks at stations it will operate with great economy and certainty, and will do away with the use of piston pumps, and all the vexations due to steam-pump engineering. Simple, durable, and reliable. Railroads equipped with water-stations complete, and warranted to give satisfaction. Send for circular.

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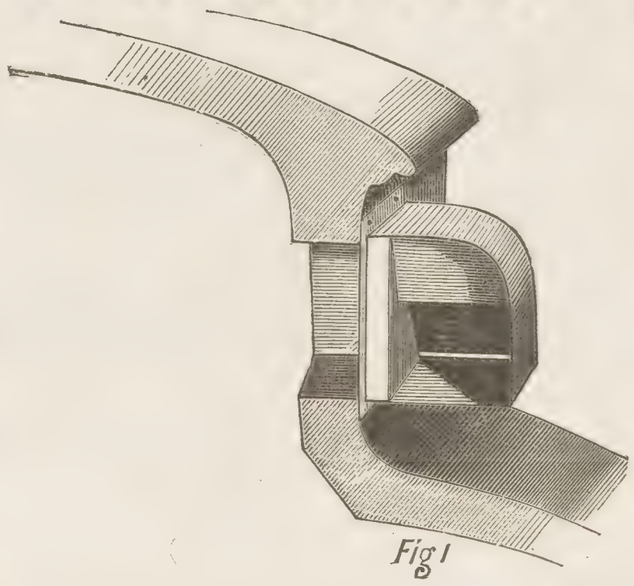


Fig 1

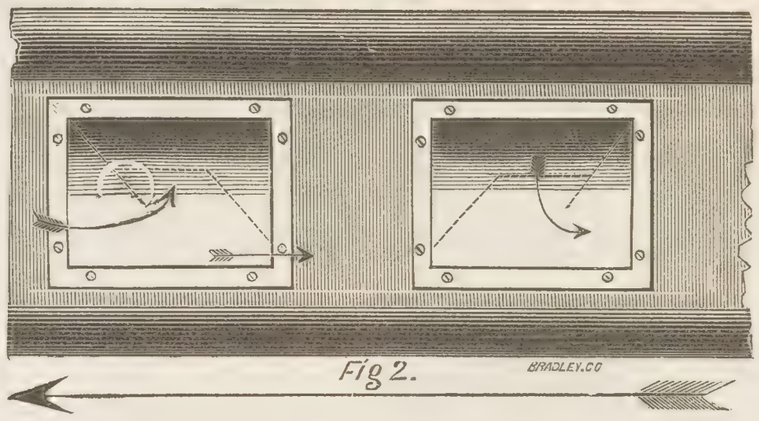


Fig 2.

THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place, it is always in readiness, and runs itself independent of all employees.

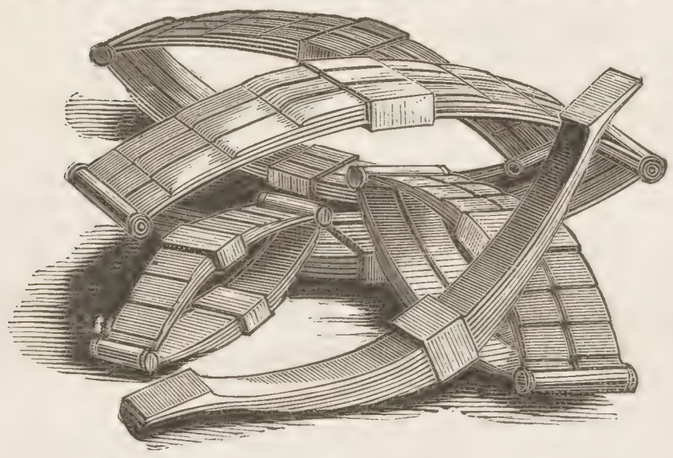
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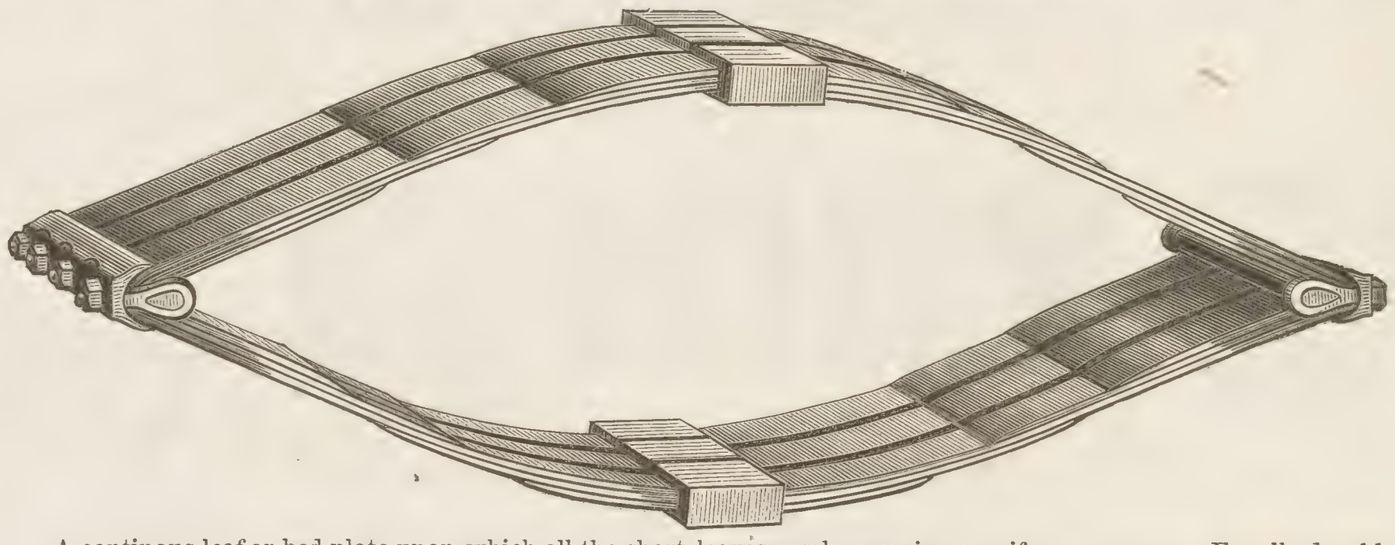
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CLIFF'S PATENT ELLIPTIC CAR-SPRING,

For Freight or Passenger Service.



A continous leaf or bed-plate upon which all the short leaves work, securing a uniform pressure. Equally durable with ordinary elliptics, and saves thirty per cent of dead weight. In successful operation on a number of roads. Made of best cast steel. CHEAPER, LIGHTER, MORE ELASTIC.

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Steel Wire Broom and Brush Works,

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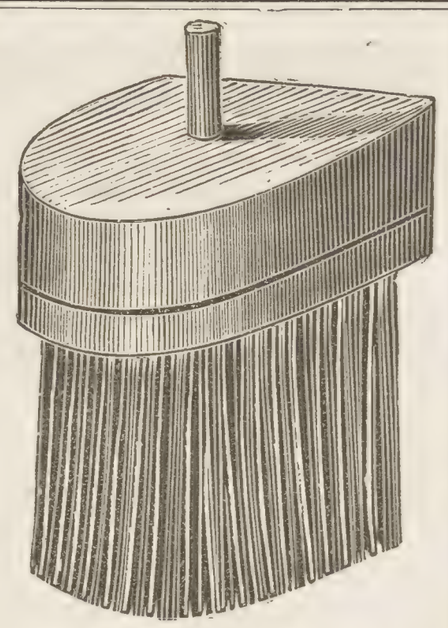
THESE BROOMS ARE USED UPON ALL THE PRINCIPAL RAILROADS THROUGHOUT THE UNITED STATES AND CANADA, AND ARE WARRANTED TO GIVE SATISFACTION.

No Railroad should be without them.

All orders will meet with prompt attention by addressing

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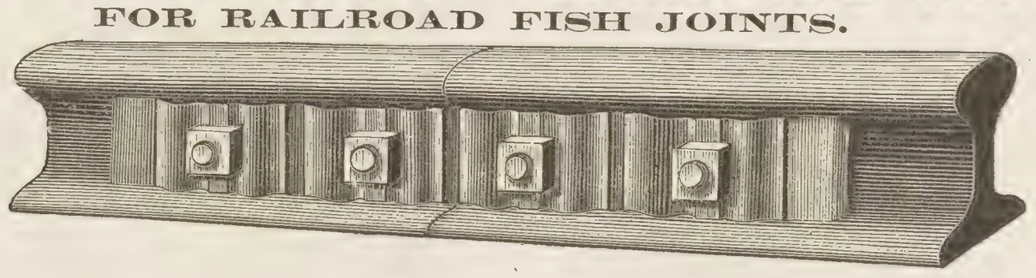
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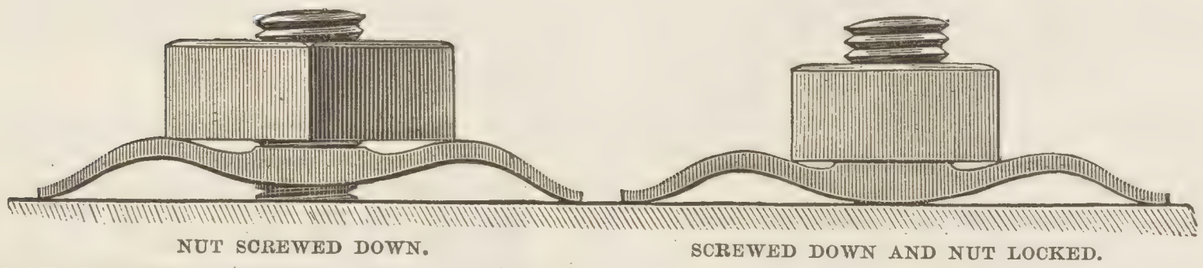


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FOR RAILROAD FISH JOINTS.



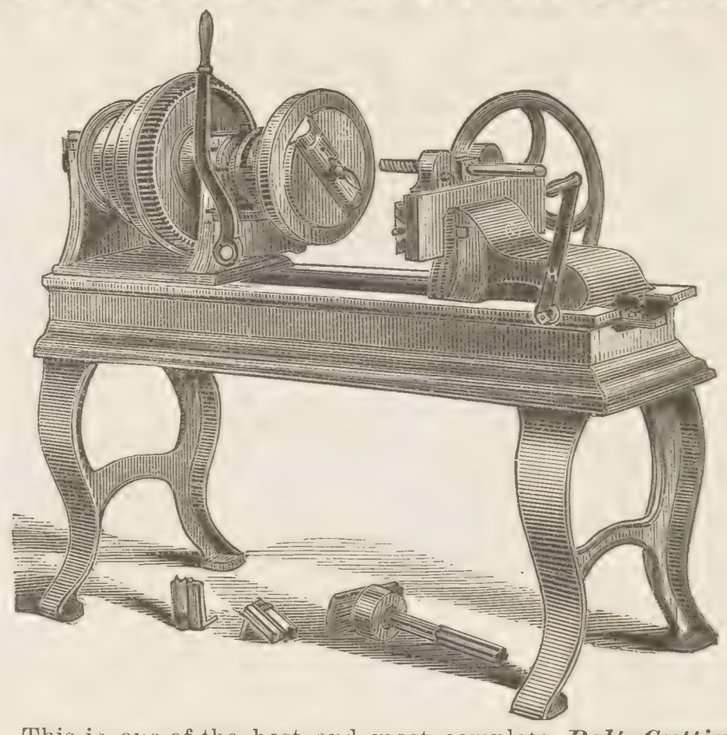


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These are OIL-TEMPERED CAST-STEEL SPRINGS, so formed as to be AUTOMATIC, locking the nuts firmly, and COMPENSATING FOR EXPANSION AND CONTRACTION AND THE STRAIN AND CONCUSSION OF MOVING TRAINS, maintaining at all times the tension on the bolts and holding the plates tight to the rails. THEY ARE APPLICABLE TO ALL SPLICE JOINTS NOW IN USE WITHOUT CHANGE OF PLATES OR BOLTS, and can be applied or removed as often as may be desired without injury to them or the bolts or nuts. They have been tested by a number of heavily-operated Railroads, and pronounced superior to all other fastenings heretofore submitted to them. They are put up in boxes, each containing 500 washers, weighing about 150 pounds. Orders, stating width of plates and the thickness of bolts, respectfully solicited and promptly filled.

Address ***SWEETS MFG. CO., Syracuse. N. Y.***

BABBITT'S BOLT-CUTTER.



This is one of the best and most complete ***Bolt-Cutting Machines*** in the market. It will cut all sizes, from ¼ upward to 3 inches, and has no equal in practical efficiency and economy of running, as well as ready adaptation to all kinds of work occurring in a Machine Shop. Two sizes are made, Nos. 1 and 2 *Send for Circular.*

P. HICKEY, Auburn, N. Y.,

For description, see page 35. *Sole Manufacturer.*

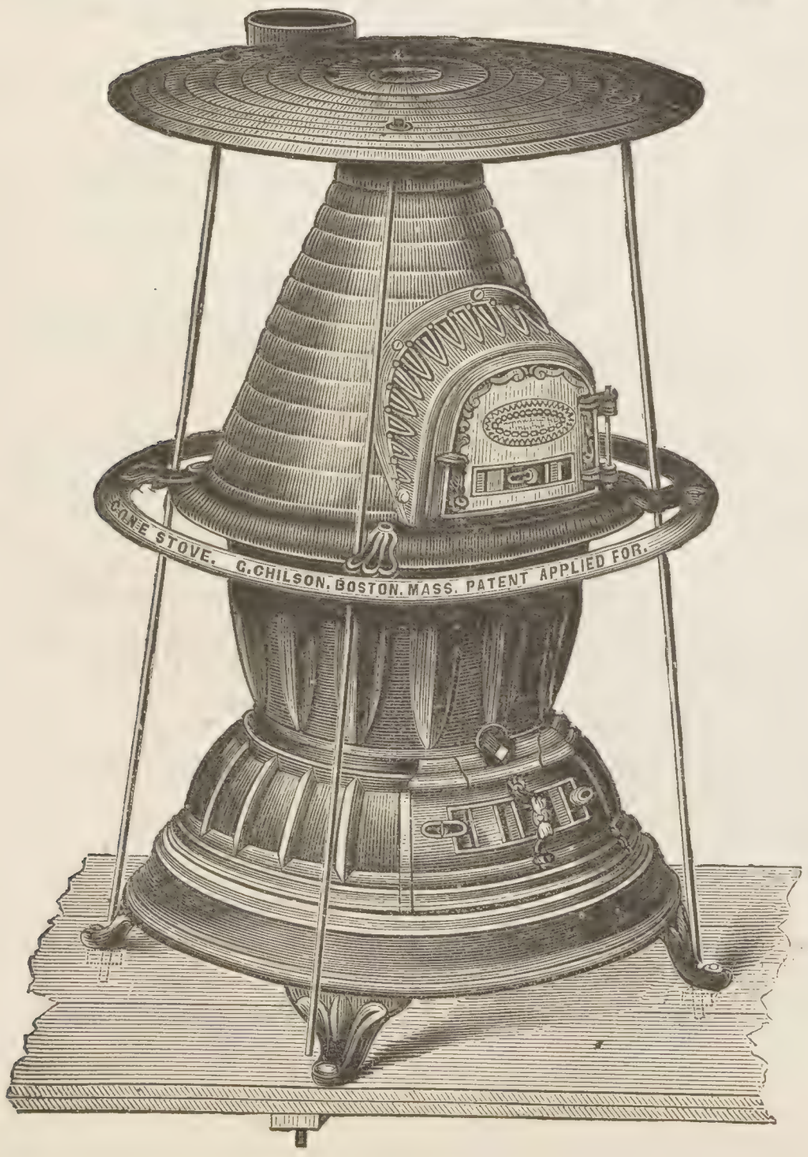


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Chilson's Patent Cone Disk Stove

ON A NEW AND MODEL PLAN.



I WOULD respectfully call the attention of Railway Managers and others interested in warming Railway Cars, Station Houses, etc., to this Stove, which has been thoroughly tested on several of our railways for a few years past, and has proved in every instance the most successful plan yet devised for thoroughly warming Railway Cars. This Stove is on a new and model plan, differing in principle and operation from all others in the United States. I claim for it *Safety*, *Economy*, *Durability*, *Simplicity*, *Cleanliness, and Beauty of Design*. Its peculiar merits may be stated as follows:

1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.

2. The broad radiating disk prevents the heat from ascending to the upper part of the car or room, but distributes and throws it down to the floor, thoroughly warming the lower currents of cold air in the car or room for a great distance around the Stove, thus securing the long desired object of making the *lower part of the car and floor comfortably warm, especially for the feet.*

3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stoves.

4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.

5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*

6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories*, *Stores*, *Offices*, RAILROAD CARS, and STATION HOUSES, *School Rooms*, *Workshops*, *etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

The BOSTON AND PROVIDENCE RAILROAD COMPANY have over two hundred of these Stoves in use, and the BOSTON AND ALBANY and several other Roads are adopting them, with the most perfect success.

BOSTON AND PROVIDENCE RAILROAD CORPORATION,
Superintendent's Office, Boston, April, 1873.

GARDNER CHILSON, Esq.: *Dear Sir:* We have about two hundred of your new "Cone" Disk Stoves in use, (a part of them for nearly five years,) for warming Passenger Cars and Stations. I can truly say that they have given entire satisfaction. These Stoves possess many important advantages over any other we have ever used, viz.: for warming the floor and displacing the cold air in the lower part of the car, whereby they are rendered much more comfortable, especially for the feet, than by any other plan known to us. The Stove is more economical in the consumption of fuel, more substantial in construction, and consequently requiring less repairs than any other in use, and so securely constructed as to prevent fire from getting out of the stove even should the car be *overturned.* I cheerfully give my testimony in favor of this Stove, and commend it to all Railroad Managers.

Yours, etc., A. A. FOLSOM, *Superintendent.*

Numerous other testimonials received from Railroads and other persons having these Stoves in use in Halls, Stores, etc., may be seen at office. Bolts are not required except for Cars and Steamboats.

Chilson's Improved Celebrated Cone Furnaces, for setting in Brickwork or in Portable Casings, Chilson's Unrivaled Double-Oven Brick Cooking-Range; Chilson's New and Splendid Arlington Portable Range; Chilson's very Superior Arlington Cooking Stove; Parlor, Office, and Store Stoves, Parlor Grates, Registers, Ventilators, etc.

Special attention given to putting up Furnaces and Ranges, and the ventilation of buildings in any part of the country.
☞ Nothing but strictly first-class work is manufactured by me. ☜

Warerooms, Nos. 99 & 101 Blackstone Street, Boston.

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RAWLINS' METALLIC PAINT.

Warranted Fire and Water Proof.

Will cover more surface and outwear any paint manufactured.

Owing to its extreme fineness, every particle is utilized. No sediment settles to the bottom, and when applied, it produces a smooth, glossy surface. With less oil to the pound, this paint will go over twice the space of other so-called "Mineral" paint, and produces a more intense color. It is entirely free from dirt, slate, or any impurities, being manufactured out of the best Red Hematite Iron Ore, and pulverized finer than any paint that has heretofore been manufactured by a process peculiar to this Company.

This paint is not affected by water or extremes of cold and heat, and is peculiarly adapted for tin roofs. It will also stand hard usage, and for railroad cars or wagons can not be excelled. It has been used by the Union Pacific Railroad Company, and by whom it is pronounced superior to any quality they have ever used.

Address

Rawlins' Metallic Paint Company,

RAWLINS, WYOMING.

ALBERT C. MCNAIRY, Pres't. JOHN COON, Sec. HARVEY T. CLAFLEN, Supt.
HENRY M. CLAFLEN, Vice-Pres't and Treas. SIMEON SHELDON, Engineer.

The Cleveland Bridge and Car Works,

[Established in 1851.]

THE McNAIRY & CLAFLEN MANUFACTURING COMPANY, Proprietors.

BUILDERS OF

RAILROAD AND HIGHWAY BRIDGES,

EITHER OF IRON OR WOOD.

Pneumatic and Screw-pile Sub-structures, Railroad Passenger and Freight Cars, Street Railroad Cars.

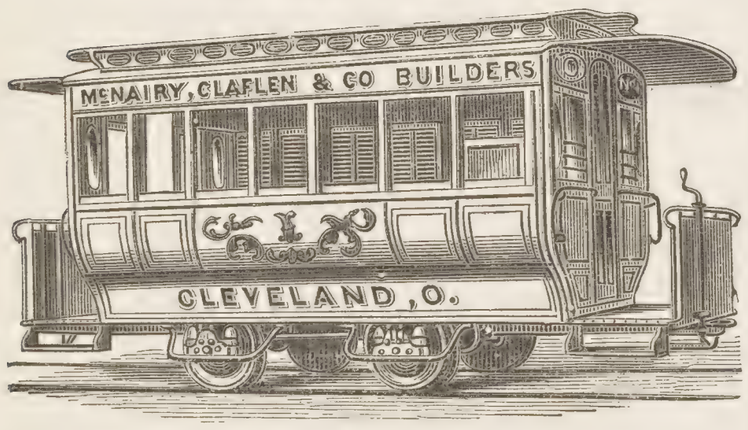
☞ Post's Patent Iron and Combination Bridges; Howe Truss Bridges, with Patent Iron Clamps; Street Railroad Cars, with Higley's Patent Running Gear and Brake.

Roofs, Turn-Tables, and Transfer-Tables

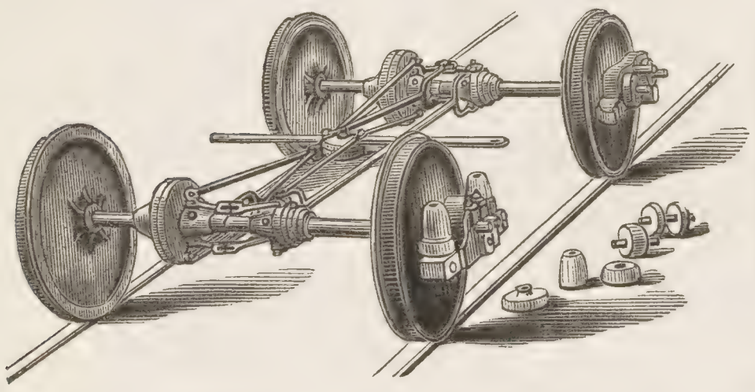
OFFICES—Waring Block, cor. Bank and St. Clair Streets.

WORKS—On Watson, Hamilton, and Lake Streets.

CLEVELAND, O.



The Lightest Running, Easiest Riding, Most Durable, and Most Economical Street Car in Use.



Higley's Patent Street Car Running-Gear and Brake.

Made and Sold by THE MCNAIRY & CLAFLEN MANUFACTURING COMPANY, **Cleveland, Ohio.**

IRON CLAD PAINT.



Address IRON CLAD PAINT COMPANY,

CLEVELAND, OHIO.

This Company owns and manufactures under WM. GREEN'S several patents, and is the only Company in the world that makes Paint from pure hard Lake Superior Iron Ore, such as is used in furnaces for making Pig Iron.

The most Economical, Most Fireproof, Most Waterproof, Most Durable, and Most Useful Paint made.

Used by L. S. & M. S. RY.	I. & ST. L. R. R.
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The K. P. R. R. CO.	L C. & L. R. R.
T. W. & W. RY.	L. S. & T. V. R. R.

Etc., etc.

OFFICE OF PURCHASING AGENT
LAKE SHORE AND MICH. SOUTHERN RAILWAY,
CLEVELAND, O., Sept. 12, 1873.

IRON CLAD PAINT COMPANY, CLEVELAND, OHIO:

GENTLEMEN: Your "Metallic Paints" known as "*Iron Clad Paints*" have, in the past six years, been extensively used and thoroughly tested by this Company, as to their *covering capacity, durability, and resistance to atmospheric changes*—latter "paint destroyer"—the most difficult to overcome in outside paints. We can emphatically accord them the highest position over any paint heretofore produced, for Cars, Roofs, Stations, Bridges, etc. The monthly increase of our orders is the best evidence that the Paint is constantly growing in favor with our mechanics.

Very respectfully yours,
A. C. ARMSTRONG,
Gen'l Purchasing Agent L. S. & M. S. R. R.

Brinckerhoff, Turner & Co.,

Manufacturers and Dealers in

COTTON DUCK,

For Car Covering and Car Seats,

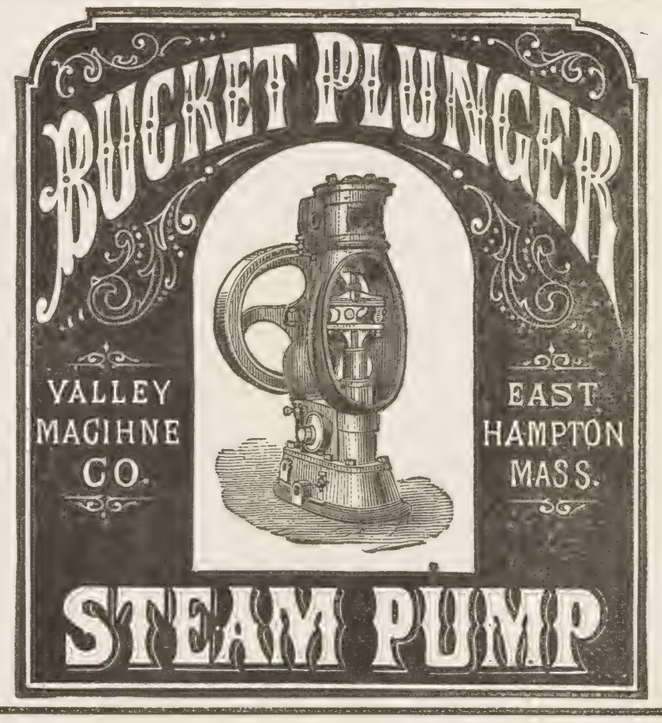
14 to 150 inches wide. Also Agents

UNITED STATES BUNTING COMPANY.

A full supply, all Widths and Colors, always in Stock.

109 Duane Street, New-York.

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SPENCER TURNER,
THEODORE POLHEMUS,
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HERRICK'S CAR WORKS,

OSWEGO, N. Y.,

Are in full operation and stocked with selected material for manufacturing

Box, Platform and Coal Cars

Prices and terms to suit the times. Orders solicited. Address,

WM. H. HERRICK, Proprietor.

RICHARD DUDGEON,

No. 24 Columbia Street, New-York,



Maker and Patentee of

Hydraulic Jacks and Punches,

BOILER TUBE EXPANDERS,

AND DIRECT-ACTING STEAM HAMMERS.

Communications by letter will receive prompt attention.

Jacks for pressing on Car-Wheels or Crank Pins made to order.

WALL'S MAGIC RENOVATOR.

For Cleaning and Polishing Gold, Silver, Nickel, Brass, Copper, and Lacquer Gilt on Metals. A chemical liquid free from acids, which will remove all tarnish, dirt, and grease, from whatever cause, almost instantaneously, and without injury to the metal.

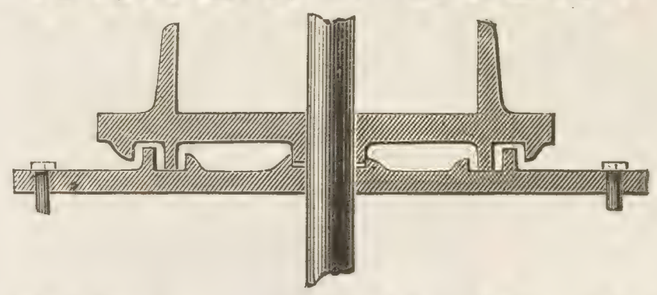
Price, per gallon, $5; in pint bottles, $1; ½ pint, 50 cents. Discount of five per cent on orders for ten gallons. A liberal commission to Agents.

Samples sent on application to

JAMES J. WALL,

P. O. Box 45 Tremont, Westchester Co., N. Y.

WARD'S PATENT



CENTER OR TRANSOM PLATE

FOR RAILWAY CARS,

With Oil Receptacle for Bearing-Ring to work in. They are acknowledged to be the best in use. See description and drawings in CAR-BUILDER for January, 1874.

Address, AMBROSE WARD,
ALTOONA, PA.

ST. CHARLES CAR CO.

This Company is now prepared to furnish on short notice, and at low prices, all kinds of

FREIGHT CARS,

built in the most approved manner and of the best material. Orders respectfully solicited. Address,

ST. CHARLES MFG. CO.,
ST. CHARLES, MO.

REFERENCES.

THOS. ALLEN, Pres't St. Louis, Iron Mountain & Southern R.R.
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WM. HOGE, Pres't St. Louis, Kansas City & Northern R.R.
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THE BUFFALO CAR COMPANY,

BUFFALO, N. Y.,

ARE NOW PREPARED TO RECEIVE ORDERS FOR ALL KINDS OF

FREIGHT CARS.

These works, recently completed, are furnished with the very latest and best Machinery, and are prepared to furnish the better qualities of work with promptness.

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TRADE MARK
MACHINE PICKED
MOSS
NEW ORLEANS

Trade Mark, Registered May, 1874.

FERGUSON & HABER,

PROPRIETORS AND MANUFACTURERS OF THE

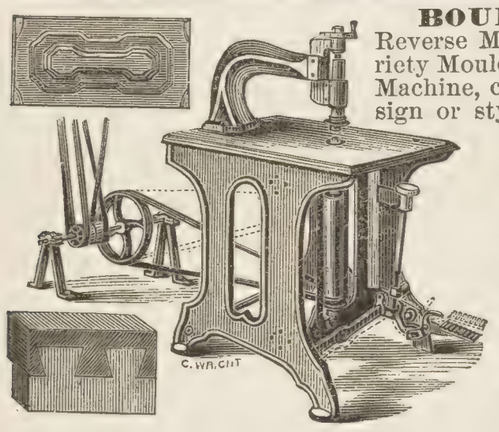
CRESCENT BRAND MOSS,

LOCK BOX 436, P. O.

FACTORY—162 FRONT and 160, 162 and 164 DELTA ST., N. O.

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Having perfected and patented our machinery, we guarantee all Moss put up by us to possess the following qualities—*full length of fibre, freedom from dust, strictness of grade, preservation of elasticity, and exactness of weight,* and used with great success by the leading carriage makers, upholsterers and railroad companies in the United States, as the most economical substitute for curled hair.



BOULT'S PATENT

Reverse Motion, Paneling, Variety Moulding and Dovetailing Machine, cuts Panels of any design or style of Mould in the solid wood, with neatness and dispatch.

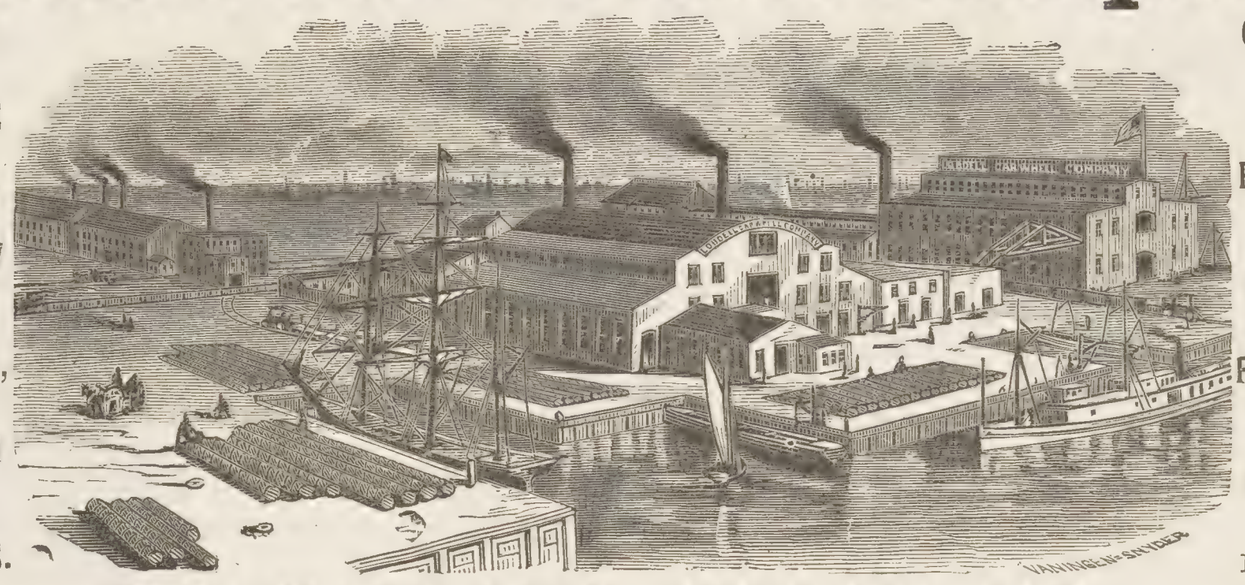
Routes and grooves for Windows, Stairs, Cars, Bridges, etc., etc.

Moulds, fine Bracket and general Scroll Work. It is a first-class Shaper and Moulder, Dovetails all kinds of Drawer and Joint Work with thick or thin stuff. Warranted Simple, Durable and Efficient. Send for circular and sample of work. Manufactured only by B. C. MACH'Y CO., Battle Creek, Mich.

J. F. SULLIVAN,
DESIGNER
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ENGRAVER ON WOOD
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Lobdell Car-Wheel Company.

SINGLE AND DOUBLE PLATE AND HOLLOW SPOKE WHEELS, FOR City and STEAM ROADS.



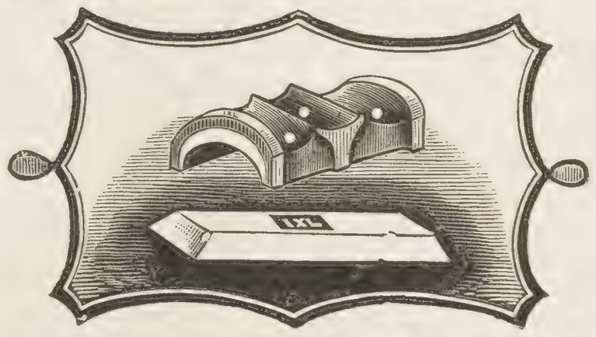
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Castings of all Descriptions.

WILMINGTON, DELAWARE.

GEO. G. LOBDELL, PRES'T. W. W. LOBDELL, SEC'Y. P. N. BRENNAN, TREAS.

ORGANIZED MAY 1869.



I X L METAL COMPANY

OFFICE AND FOUNDRY,

No. 7 North Third Street, ST. LOUIS, MO.

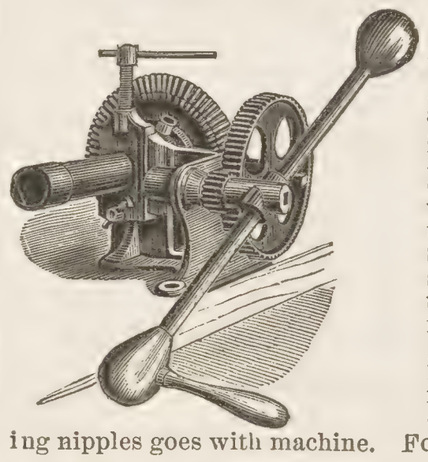
Sole Proprietors and Manufacturers of the

I X L ANTI-FRICTION METAL AND JOURNAL BEARINGS,

Railroad Companies will find a great saving in their expenses, and very little trouble from hot boxes, by using these bearings. A sample set for a trial sent free of charge, by sending a Brass for pattern. Mills, Steamboat Companies or others, will find this a superior Composition for Bearings.

CHASE'S
Pipe-Cutting and Threading Machine.

(W. D. CHASE'S PATENT.)



This important tool is designed to fill a want long felt by STEAM AND GAS FITTERS AND MACHINISTS for cutting and threading pipes rapidly and cheaply. An Apprentice Boy, with one of these, can do more work than Two Men with old appliances under the old system. No PIPE SPLITTING! No BEVEL INSIDE OR OUT! It cuts threads and makes nipples for all sizes of pipes, from ⅛ to 2 inches. Weighs only 100 lbs. Stronger than any machine made. A full set of collars and lengths for making nipples goes with machine. For Sale by

MORRIS, TASKER & CO., Philadelphia, New-York, and Boston.

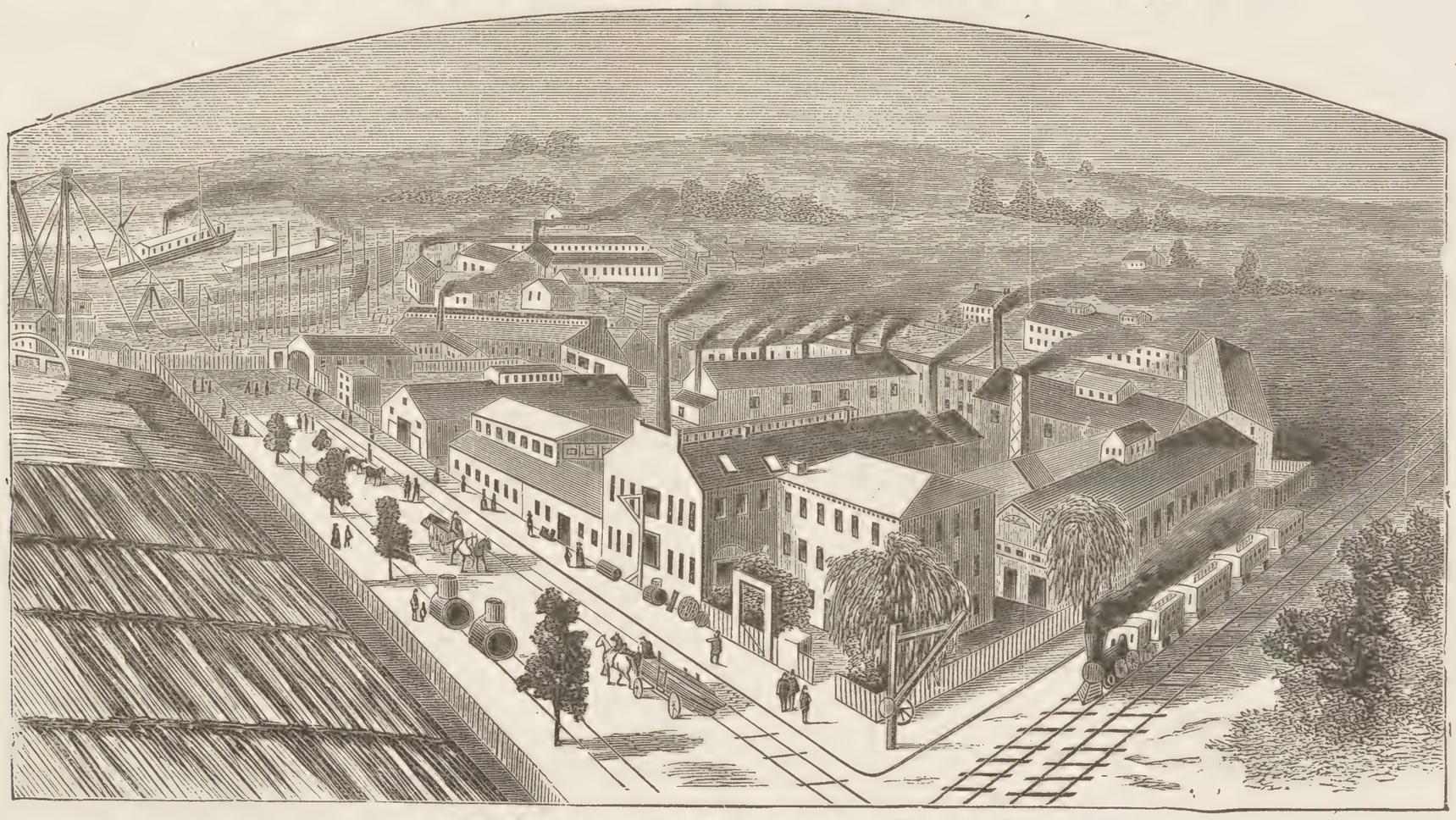
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The Chase Manufacturing Co.,
120 Front St., New-York.

Send for Circular.

THE HARLAN & HOLLINGSWORTH CO.,

WILMINGTON, DELAWARE,



BUILD ALL KINDS OF

RAILROAD CARS:

FIRST and SECOND-CLASS DRAWING-ROOM, SLEEPING, BAGGAGE, MAIL, and EXPRESS, BOX, and FLAT.

MURPHY & CO., NEWARK, N. J.,
MURPHY, SHERWIN & CO. CLEVELAND,
Varnish Makers.

We call attention to the following prices of our Varnishes especially adapted to Railway Uses, and submit that they combine more prominently than any others, the INDISPENSABLE REQUISITES for Railway Consumption. They are of heavy body, light color, quick drying, and are guaranteed to give a maximum of durability.

Wearing Body, (For Outside Finishing.)	**$3 50**
Hard-Drying Body, (For Under Coats on Cars.)	**5 00**
Rubbing Body, (For Under Coats on Cars.)	**4 50**
Inside Car, (For Interiors of Cars.)	**4 50**
Engine Finishing, (For Last Coats.)	**5 00**
Engine Rubbing, (For Under Coats.)	**4 50**
Japan Gold Size, (For Binding and Hardening Colors.)	**3 50**
C. M. Japan, (For Drying and Binding Paints.)	**2 00**
Black Enamel, (For Smoke Stacks of Engines.)	**3 00**
No. 1 Black, (For Iron-Work.)	**1 50**

UNIFORM SUPERIORITY IN QUALITY AND FIXED PRICES TO ALL will continue to characterize these goods, and Satisfaction in their use is assured.

JOHN JEWETT & SONS,

182 FRONT ST.,

New-York,

MANUFACTURERS OF

PERFECTLY

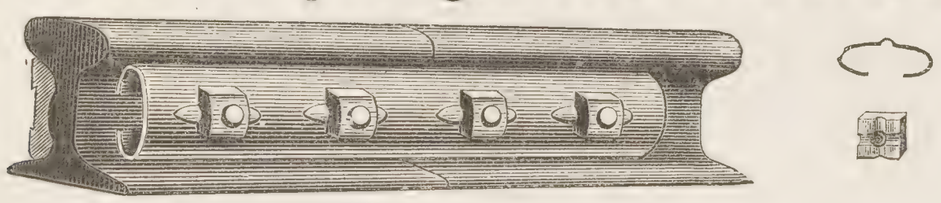
Pure

JEWETT & SONS PERFECTLY PURE WHITE LEAD TRADE MARK

JEWETT'S PERFECTLY PURE LINSEED OIL RAW, BOILED & REFINED.

WHITE LEAD AND LINSEED OIL.

The Giant Spring Fish-Plate Joint.



A Combined Nut-Lock and Fish-Plate. The Nuts are securely held in place by a Steel Plate or Rib, and protected from jar and vibration. Costs no more than ordinary wrought-iron plates.

VOSE, DINSMORE & CO.,

32 Warren St., New-York.

PULSOMETER!

See Advertisement, 1st Page.

THE DISNEY CAR COUPLER,

Patented June 24th, 1874. Manufactured by

F. E. CANDA & CO.,

CHICAGO, ILL.

Fig. 1.

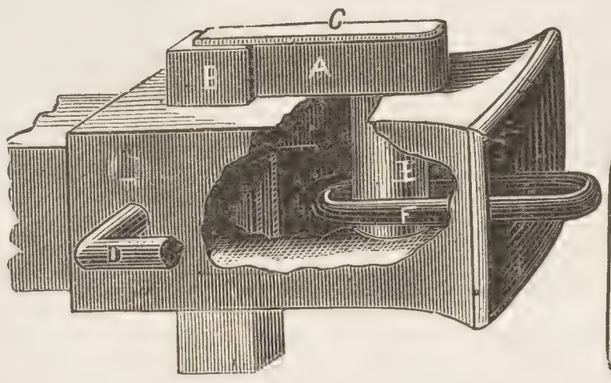


Fig. 2.

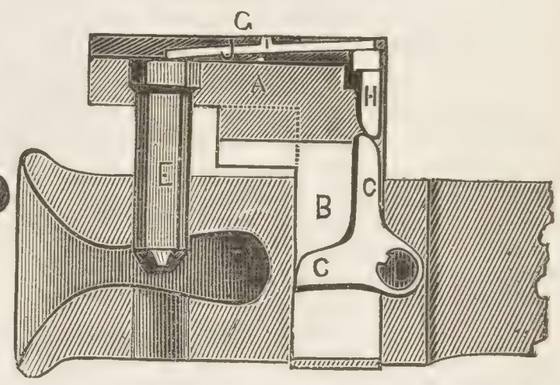


Fig. 1 represents the draw-head with a portion broken away to show the interior.

Fig. 2 represents a vertical, sectional view. *A B* we designate *The Drop*, the upper part *A* serving as the pin-holder. *D* is a lever by which the device is operated, fastened to a shaft passing through the draw-head. *C C* is a forked piece keyed to this shaft. *H* is a small loose pin. *E* is the large pin for securing the link *F*. *J* is a lever resting on the heads of pins *E* and *H*, with its fulcrum on cap-piece *G*. *Then*, when set for coupling or uncoupling, as in Fig. 2, the link *F*, in passing the mouth of the draw-head, raises pin *E*, which by lever *J* forces pin *H* against and displaces the upper arm of *C C*, allowing the *drop* to fall, carrying pin *E* with it.

From the above cuts and description it is apparent that this device combines simplicity in its construction, reliability in its working, and durability in all its parts.

We designate as points of special advantage:

That working from the side of the draw-head, it leaves no opening at the top for dirt, gravel, or accumulations of ice and snow to interfere with the working of the coupler.

That, while the link is always held in a horizontal position for entering, yet it has sufficient vertical movement to accommodate itself to cars of different heights, not exceeding a variation of six inches, without using the crooked link.

That the mouth of the draw-head is of such shape as secures the pin from all liability of bending or breaking.

That it always couples when desired, or set for coupling, and will *never* couple when not desired.

That, working readily from the top and sides of cars, there is no risk of life or limb.

That the pin can never be lost or stolen.

And further, that from its reliability of working, and durability of parts, combined with the device for securing it to passenger cars, makes *This Coupler* the safest and by far the most economical *Passenger Car* Coupler ever introduced.

The Disney Car Coupler, wherever tried or however thoroughly tried, has given the most perfect satisfaction, both as a Freight and Passenger Car Coupler.

For further information, address

H. C. KIBBE, 419 California St., San Francisco, Cal.,

AND

F. E. CANDA & CO., Railroad Contractors and Car Builders,

79 SOUTH CLARK ST., CHICAGO, ILL.

THE

Atlantic White Lead

AND

LINSEED OIL COMPANY,

Manufacturers of

WHITE LEAD,

DRY AND IN OIL.

RED LEAD AND LITHARGE,

CRUSHERS OF LINSEED OIL.

ATLANTIC WHITE LEAD. PURE. WARRANTED. ROBERT COLGATE & CO.

TRADE-MARK.

Robert Colgate & Co.,

287 Pearl St.,

NEW-YORK.

KATAHDIN CHARCOAL PIG IRON.

O. W. DAVIS, Jr., Manufacturer, BANGOR, MAINE.

SOUTH BOSTON IRON CO.'S TESTS OF KATAHDIN PIG IRON, 1874:

	Density.	Tensile strength per square inch.
No. 2 Pig Iron,	7,2002	18,894
" 3 "	7,2432	26,928
" 4 "	7,2305	30,765

Nos. 1 and 2 are soft and strong, suitable for machinery and fine castings, boiler plates and steel. Nos. 3 and 4 are close-grained and tough, adapted for steam cylinders, radiators, locomotive castings, car-wheels, hydraulic presses, etc. All grades contain less than one-tenth of one per cent of sulphur or phosphorus. Shipped by rail or water from Bangor to any part of the country.

THE NATIONAL CAR BUILDER.

DEVOTED TO THE INTERESTS OF RAILWAY ROLLING STOCK.

Vol. VI. *No. 4.* APRIL, 1875. *$1.10 per Annum. Single Copies, 10 Cents.*

The Figure and Color of Wood.

THE figure of wood depends more upon the particular mixings and directions of the fibres than upon any difference of color. If a tree was found formed of merely circular rings, like the section of an orange, filled with layers of peel instead of pulp, the horizontal section would exhibit circles; the vertical, parallel straight lines; and the oblique section, parts of ovals; but few, if any, trees are to be found either exactly perpendicular or straight; and therefore, although the three natural sections have a general disposition to the figures described, every little bend and twist in the tree disturbs the regularity of the fibre, and adds to the variety and ornamentation of the wood. A perpendicular cut through the heart of the tree is the hardest and most diversified, because in it occurs the most profuse mixture and density of the fibre, the first and the last in point of age being presented in the same plank; but the density and diversity lessen as the board is cut further away from the axis.

Curls are formed by the confused filling in of the space between the forks of the branches. The beautiful figure thus induced causes a log, say of mahogany, to be valuable in proportion to the number of curls it contains. There is great competition at public auctions for such logs, and prices which seem astonishingly large are sometimes given for a log known by judges to contain several fine curls. Occasionally some disappointment may be experienced when the log is opened, but not often. The curl generally shows itself on the outside, where it can be seen, and there is always the possibility of there being interior ones as well, which do not show on the surface.

Figure is also produced as follows: The germs of the primary branches are set at an early period of the growth of the parent stem, and thus give rise to knots. But many fail to penetrate to the exterior, and are covered over by the more vigorous deposition of the annual rings. Each branch is a miniature tree down to the smallest twig, and this process goes on in each individual branch just as in the trunk. These knots produce figure in the following manner: When the germ succeeds in forcing its way to the surface, the future rings of the trunk bend and turn aside when they encounter the knot, and in the softer wood do not unite with it. This accounts for whitewood knots being so liable to fall out. The turpentine in other sorts of woods acts as a sort of cement, and keeps the knot in its place. The hardness of knots is due to the close grouping of the fibres, and to their compression by the surrounding wood, which itself is allowed expansion by the yielding nature of the bark.

The same operation goes on beneath the ground in the roots of a tree, and splendid furniture veneer is obtained from some descriptions. The bird's-eye maple has internal points or spines on the inside of the bark, which penetrate the wood and make irregular indentations. These cause the peculiar appearance which is so much prized, and from which the wood takes its name. In woods the figure of which resembles the ripple marks of the sea on fine sand, such as satinwood, sycamore, mahogany, ash, etc., the figure is produced by the serpentine form of the grain. The fibres of all such pieces are wavy on the face at right angles to that on which the ripple is observed, if not on both faces, those parts of the wood which happen to receive the light being brightest.

Woods having the silver grain, or, as called by botanists, "medullary plates or rays," possess another sort of adornment—namely, a sort of dappled effect, or an effect similar to that produced on silk by threads running crosswise to those longitudinally disposed. English oak, Riga and Dutch wainscot logs, Austrian wainscot, etc., have this peculiarity. In the oak plank the principal streaks or lines are the edges of the annual rings, which show, as usual, parallel lines (more or less waved) from the curvature of the tree or the neighboring knots and branches. The damask pencilings, or broad, curly veins and stripes, are caused by groups of the medullary rays, which undulate in layers from the margin to the centre of the tree, and creep in betwixt the longitudinal fibres. Had the fibres of trees been arranged with the uniformity and exactitude of a piece of plain cloth, they would have shown an even, uninterrupted color; but being arranged by nature in irregular, curved lines, almost every intersection of them by the hand of man partly removes some and exposes others, thus causing a great variety of figure. To such a boundless extent do the changes caused by tints, fibres, curls, knots, etc., exist that the cabinet-maker scarcely ever seeks to match any pieces of wood for the purpose of causing uniformity of figure in the article he is making, and, indeed, diversity is more pleasing to the eye than uniformity would be, if it were practicable.

As regards color, some woods are nearly uniform, and some have several shades of the same hue, or of two or three different colors. In the horizontal section of such woods the tree seems to have clothed itself with different coats of various colors—such as tulipwood, kingwood, zebrawood, and rosewood. In the ordinary planks these markings get drawn out into stripes, bands, and patches, or wavy figures of the most beautiful or grotesque character. Woods variegated both in grain and color are more generally employed for objects with smooth surfaces, such as cabinet-work. Such are Amboyna, kingwood, some mahogany, maple, partridge, rose, satin, snake, tulip, and zebrawood. Beautiful specimens of marquetry which we have recently seen aptly illustrate the use of such wood for the purpose of ornamentation, and they also prove that they are out of place in other than smooth surfaces, for the same style of work in mouldings has a decidedly inferior effect. The colors of fancy woods are not liable to fade by exposure to light, tulipwood being an exception; but age of course darkens them and mellows the general effect. But the whitest of varnishes should be applied, or the natural tint is liable to be spoiled. The rich greenish-brown of walnut is much esteemed, and especially for pianoforte cases. The large makers own stocks of this and other fancy woods to an extent few have any idea of. The rich, deep orange of Spanish mahogany makes beautiful tables and counter-tops, and its large square surface makes it peculiarly adapted to either use. Honduras, of a brownish tint, is used for all kinds of superior cabinet-work, while oak is principally employed in those parts of house-building where durability is a necessity. Wainscot is preferred for cabinet-work, and the Austrian has lately come into deserved favor. Pitch-pine, too, is pleasing, both as to color and figure; rosewood, with its rich tints, is not so much used as formerly.—*Journal of Applied Science.*

Theory and Practice.

IT is surprising how small a percentage of the human family are accustomed to the habit of constant, persistent thought, and it is still further wonderful how few of them manage to make their ideas of any practical utility. There is no royal road to either success or learning; but the nearest approach to such a thoroughfare may be found in indefatigable study and reflection. Especially in the mechani cal arts, the habitual combination of manual practice with mental labor has proved the one thing needful for the successful inventor and mechanic; and it is noteworthy that scarcely a single great improvement or discovery has ever been given to the world save those proceeding from the mental and physical labors of thinking artisans. It is unnecessary to quote particular instances in proof of this assertion, since they are familiar to any person of ordinary information. The locomotive and marine engines, the spinning-machine, the cotton-gin, and the electric telegraph, all owe their origin neither to mere theorists nor to automatic mechanics, but to men who were not only qualified to construct, but to understand the philoso phy of construction; not only competent to originate ideas, but to thoroughly test their value after they were conceived.

Progress has been made in the last half century, and we do not doubt that the average artisan of the present is not only better skilled but better educated than were his progenitors. But, while improvement has been made, there is no lack of room for still greater skill, for wider and more profound thought. The class of men who perform their work in the same manner as did their ancestors is by no means extinct. It is not enough that a mechanic should be a machine, as so many of them are; a reasonable machine, perhaps, but whose reasoning powers are rusty and inoperative from disuse. It is not enough to perform a job of work in a specific manner because somebody else makes it in that way, and in ignorance of the reason for so doing. Reflection costs little; it is worth much, and is, indeed, indispensable, if one would keep closely in the wake of modern progress.

There is no lack of inventive genius in this country; indeed, more patents are issued yearly at Washington than at any other capital. But many of these devices indicate a painful want of education, theoretical or practical; often of both. Witness the long list of abortive efforts to discover that mechanical philosopher's stone, perpetual motion. How many men, of no mean ability, have wasted years of valuable time, and expended countless sums in attempting to construct what an ordinary knowledge of the laws of force would have proved an impossibility. The most beautiful model we ever saw was that of one of these machines, built by a mechanic in this city, at an expense of little less than $1000. The workmanship was perfect; there was no absence of manual skill; but it was a failure because "perpetual motion," in that sense, is interdicted by natural laws.

Such facts as these betoken the urgent importance of proper study and thought, as connected with those who produce our machinery and operate it. America has made great progress in the right direction. Debarred at the outset from competition with Great Britain in manufactures, because of the immense disparity in the cost of labor, we have produced machinery which enables us to pay good wages and produce work as cheaply as the English manufacturer, whose employees receive much less. But as yet perfection is not attained; there is and ever will be plenty of room—room for labor, thought, and improvement.—*Exchange.*

Facts for Law-Makers to Ponder.

A CORRESPONDENT of the *Cincinnati Gazette* writes as follows about the practical working of recent railroad legislation in Ohio:

No statute can make one man as strong as another, or compel one to do the same work as another. Nor can one man be compelled to carry a heavier load than another with an equal expenditure of force, nor to carry a burden up a hill equal to that which another carries on level ground, at the same cost. And what is true with the labor or the expenditure of force with an individual, is true in mechanics, and is just as true with railroads as with men.

Is it possible that one railroad, working over grades where one engine, for instance, can move but five loaded cars, can do work—carry freight—at the same rate that another road can on which the same engine can move, at twenty miles an hour, forty loaded cars?

A difference as wide as this actually exists between roads in this State. Yes, and more. One road—and more likely the very road where the engine can move the forty cars—may have ten times the business that another has, and that regular. It may carry its freight or passengers 500 miles while the other carries them but fifty. Is any thing more needed than the bare statement of such facts to convince any person with brains enough to admit of conviction of any thing, that roads so situated *can not* run trains and move freight or carry passengers at the same cost that another can?

Statutes can't alter these differences, and if they can't, how are roads working under conditions so widely different to do their work at the same cost?

Procrustes could chop off the limbs of those too long to fit his iron bedstead, or rack them asunder if too short, but he could not secure a growth of men of one height.

The law of April last proposes that all railroads shall, whether they can or not, do work at the same cost. The Legislature has taken the oldest roads—as the Lake Shore and Little Miami—where a single freight-engine can move off with thirty or forty cars, and having limited rates to the earning capacity of such roads, applies this gauge to all others, and it amounts to a Procrustean edict that it is impossible in the nature of things to carry out.

Railroads can be crushed under it, but they can't work under it. It is a most unreasonable, unwise, and unjust attempt to crush new enterprises with such legislation.

With such laws in force, and with the spirit now prevailing with reference to railroads, they are simply fools who undertake to build new roads, and they who put their capital in them are little wiser. New roads can not be built under such laws—laws which practically work the confiscation of the capital put in them. Moreover, the conditions of the law in question are such, in some of its features, that not a railroad in the State has complied, or can comply, with it. What railroad does or can carry looking-glasses at five cents per ton per mile? Or move loaded cars from station to station for a dollar?

The law evidently was passed in a fog, and without a knowledge of what its workings would necessarily be. It is one thing to *regulate* the operations of railroads, and quite another to confiscate their property; or, by limitations fitted to one road, crush another.

Continental Railway Rolling-Stock.

AT the late Vienna Exhibition, a variety of railway-carriages and wagons were exhibited, all of Continental manufacture. One of the reports contained in a blue-book lately opened, states that a large proportion of these vehicles were of the sleeping-carriage class, and generally built with iron panels, which makes them in many respects objectionable. Austria was the largest exhibitor of rolling-stock, and next to her came Germany. The passenger-carriages on the Austrian lines are commodious and lofty, the tires and axles being generally of Bessemer steel. The third-class carriages are inferior to some of our newer third class, and the second-class, as well as the first, are uncomfortably cushioned and upholstered, and the fittings of the carriages by far too ornate. There is a fourth class on the Austrian lines, covered and with windows, but without seats. It apppears that when the principal Austrian lines passed into the hands of the French company, the four-wheeled and four-compartmented carriages were substituted for the large six-wheeled carriages on the American system, which are now used only for slow trains; but the prejudice against the American bogie carriages on the Austrian and German lines is hardly well-grounded. Some novelties in the way of railway-wheels were exhibited, such as wheels of solid wrought-iron, and chilled cast-iron with wrought-iron spokes, also wooden-disk wheels. Some very excellent improvements in the heating of railway-carriages on the Austrian lines were also shown. The use of mineral oil for the lubrication of axles is in general use on the Austrian lines. A novel two-story carriage, such as are in use on some French railways, was exhibited. A German maker exhibited a carriage with an arrangement causing the axle to radiate while traversing curves. A very fine saloon sleeping-carriage was exhibited by Belgium, and Italy showed some of the very comfortable carriages used for the Mont Cenis tunnel, lighted by high-pressure gas. A mode of lighting carriages by gas prepared from heat was also exhibited in the German department.—*Herapath.*

What Invention has Done.

NECESSITY is said to be the mother of invention. That may be, but time is also. During the years when men were worked for twelve and more hours, but few and crude inventions lightened labor, and this because mechanics were more concerned for what they should eat and wherewithal they should be clothed, than in studies to adapt machinery to mechanical uses. The dates of the patent-office will show that most inventions of value have been made since the inauguration of the ten-hour system, and now the machinery of the country is equal to the labor of twenty-eight million men. Hitherto ten hours' labor has been necessary for the wants of civilization, because of the absence of machine labor, and the presence of so many men living by their wits, and at the expense of the industry of the country. Now we have machinery by which men are enabled to do ten times the work that was or could be done by our fathers fifty years ago, and some inventions do not fall short of doing one hundred times the amount of work that was then accomplished. There is no longer a necessity for so much work; the wants of the world do not require it; grain can be raised and made into bread with one twentieth of the labor; a ship can be built in less than one fourth of the time; a house can be erected and ready for use in one tenth of the time, and less than a tenth of the men can do it; one man can make more shoes and boots, and hats and clothes, than twenty men could then have done; the railroads will carry our goods and produce two thousand miles, and across the continent, in less time than our fathers could haul their grain to a profitable market; the daughter of twelve years of age can do the washing while her mother gets breakfast and takes care of the baby; the accomplished young lady can churn the butter while she is hemming a handkerchief, and make a dress in less time than her grandmother could have basted it together. Gen. Grant's father took twelve months to tan leather that can be done in six days; men of genius and late inventors now furnish fuel from the vapor of crude petroleum cheaper than a man can afford to dig the coal or chop the wood, if he has plenty at his door; we can transmit the force necessary for any kind of machinery from the rocky banks of a river to a suitable valley for manufacturing purposes cheaper than the grading can be done for buildings at the source of power; framed doors, window-blinds, or sashes can now be made in less time than our grandfathers could have dressed the stuff; and so on throughout the entire catalogue of industrial pursuits.—*Ex.*

New Passenger-Coaches for the Illinois Midland Railway.

THE Terre Haute *Journal* of March 15th contains the following notice of two new passenger-coaches built for the above-named road by the Wason Manufacturing Company:

"Persons passing the Union depot yesterday could not fail to notice the two new and magnificent coaches that had just arrived, bearing the now well-known words 'Illinois Midland Railway.' They are without doubt the finest to be seen in the West, and there are few roads in the United States that are in possession of finer specimens of rolling-stock. As they are not only new in construction, but new in design and style, a description would be interesting and proper.

"One of them bears the words 'City of Terre Haute,' and the other 'City of Peoria,' the same words being painted in handsome gilt on the interior, in each end. The first thing that strikes the beholder is the new style in seats. They are arranged to accommodate thirty-four passengers to each coach. Each chair is a large and luxurious affair, mounted on pivots to be turned to suit the convenience of the occupant. The back is of open split-cane work, very comfortable in hot weather. The seat is broad and elastic, covered with dark crimson velveteen. The back has sliding arrangements of a new kind, by which it can be quickly raised in the day-time or lowered at night for sleeping. There are very convenient foot-rests, and a movable frame is made from the seat to the foot-rest, so as to accommodate any desired position of the body. In the day-time the chairs are as have been described. But at night each is completely covered by a large and handsome red plush mattress, which takes the shape of the chair from the top of the back all the way down to the foot-rest, thus taking the place of a berth, with the advantage of entire ventilation. In the common sleeping-car the berths are so close that often, especially in warm weather, the upper ones are almost insufferable. These in Mr. Hervey's coaches are so admirably arranged to take the place of both bed and chair, that they are preferable to those in the

Pullman coaches. These thirty-four chairs are arranged in three rows. Half the length of the car there are two rows on one side and one on the other, and in the other half the double row is on the other side. This balances the car and makes every thing pleasant. A neat white pillow-case with cushion is slipped over the top of each mattress at night.

"The floors are laid with costly Brussels carpet. In each end are closets containing stoves, washing apparatus, porter's articles, etc. They are heated by steam throughout. Six brilliant silver-plated lamps are suspended from the ceiling. The windows are unusually large, and provided with convenient blinds. The chief point of excellence in the ornamentation of these coaches is in the fact that the entire wood-work of the interior is of the finest light-colored and beautifully grained mahogany. It was at first to have been black walnut, but this is so common that, though costing much more, the mahogany was substituted. There is little gilt ginger-bread work, but every thing is constructed in such a manner that, while royally gotten up, the furnishing will appear almost as well in five years as now. Their exterior has been made to accord with the furnishing in every way. The monogram of the railway, 'I. M.,' is seen in numerous places. The oval plates on the sides contain the maps of the road. The paint and varnishing are brilliant. The trucks are spread out a foot longer than usual, so that the cars may roll more easily, and be more elastic. There are double ventilators in the roofs. The cars will be taken to-day to the shops at Paris and provided with air-brakes. They will then be immediately put upon the regular route from Peoria to Indianapolis.

"These splendid coaches were built by the Wason Manufacturing Company, of Springfield, Mass.: a company that turns out the finest cars in the world. They cost, including the royalty to the patentee of the chairs, fully $10,000 each. They were mainly designed by Mr. Hitchcock, General Superintendent, with some hints also from President Hervey, who has been for some time in Europe, where he could not well supervise their construction."

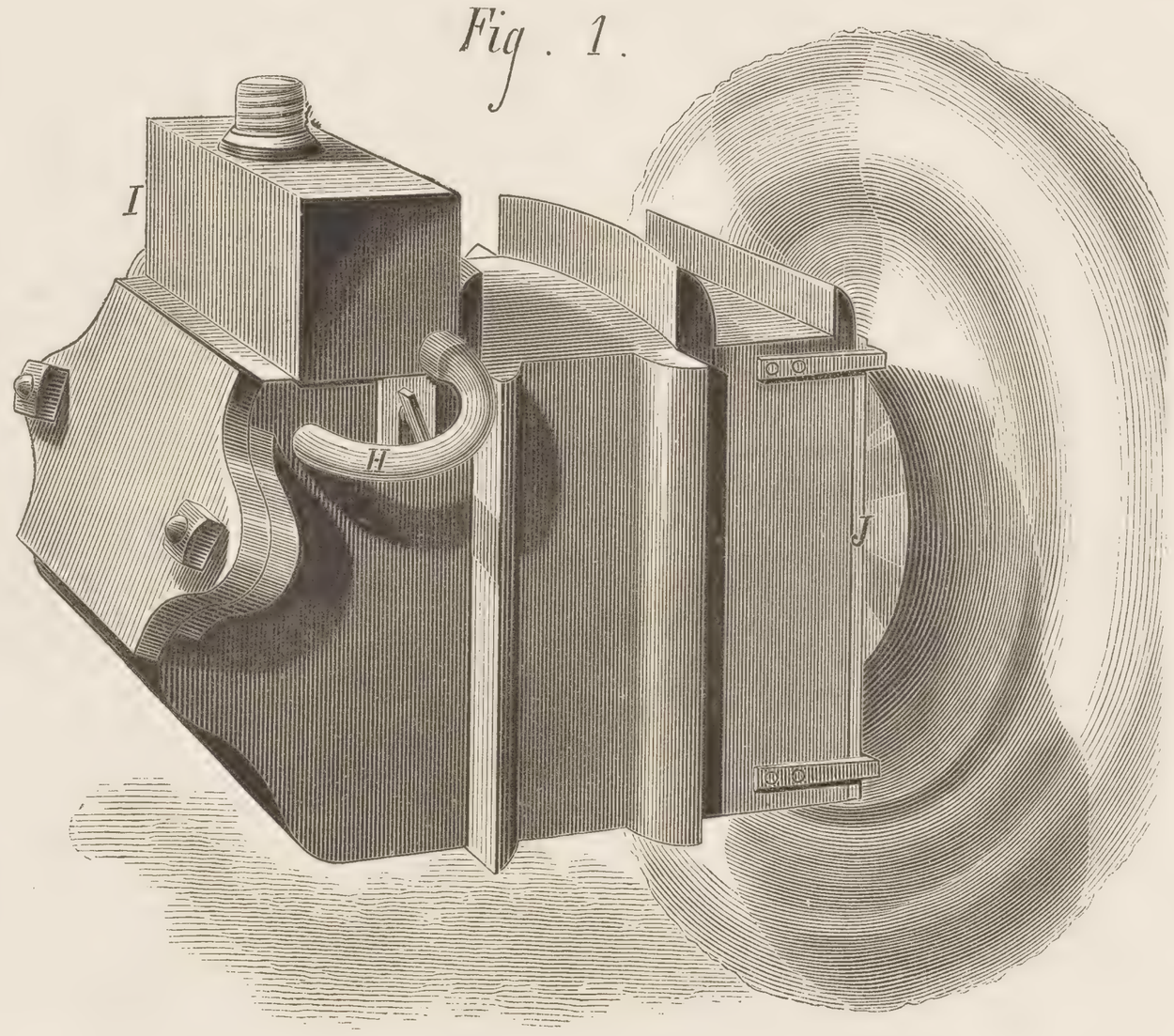
A CHEAP India-rubber cement may be made by cutting virgin rubber with a wet knife into the thinnest possible slices, and with shears divide these into threads as fine as fine yarn. Put a small quantity of the shreds (say $\frac{1}{10}$ or less of the capacity of the bottle) into a wide-mouthed bottle, and fill it three-quarters full of benzine of good quality, perfectly free from oil. The rubber will swell up almost immediately, and in a few days, especially if often shaken, assume the consistency of honey. If it incline to remain in undissolved masses, more benzine must be added; but if too thin and watery, it needs more rubber. A piece of solid rubber the size of a walnut will make a pint of the cement. This cement dries in a few minutes, and by using three coats in the usual manner, will unite leather straps, patches, rubber soles, backs of books, etc., with exceeding firmness.

Improved Railway Axle-Box.

THE engravings illustrate an invention the design of which is to obviate two of the most formidable difficulties attending the use of axle-boxes, namely, the heating of the bearings and the entrance of dust. The usual means of prevention are well-fitted brasses, the use of alloys least liable to cut, and of various lubricating substances best adapted to counteract friction. This device aims at the root of the evil, and comprises two distinct inventions—one for excluding dust, and the other for keeping the brasses cool.

To secure the former end, the box must be perfectly tight next the wheel, sufficiently so to prevent the leakage of oil, and yet it must allow the axle abundant play in its lateral and other movements. By reference to the sectional view, Fig. 2, the manner in which this is accomplished will be seen. A is the back of the box, cast in one piece with the body. A metal guard and bolts secure to the inner side a bellows-joint, B, which is stamped out of leather, and hence has no seam. The outer portion of this joint is similarly attached to a gun-metal ring, C, shown more clearly in detached drawing in upper part of Fig. 2. On the axle a ring, D, is shrunk; and just outside of this, another ring, E, of iron, containing spiral springs, which tend to push it outward, is placed. The springs serve to take up any wear of the rings. The bellows-joint slips directly over these, so that the ring C bears against the ring E. Outside of the ring C, and also bearing against it, another iron ring, F, is secured rigidly to the axle. It will be seen, therefore, that the leather forms a screen between axle and box, and, as it is attached to both and is flexible, it forms no obstacle to the lateral play of the former. The two rings E and F, bearing directly against the ring C, revolve, of course, with the axle; and as the ring F is slightly tapered, its natural effect, owing to the centrifugal force due to the revolution, is, it is claimed, to throw the oil away from the joint, and thus to prevent leakage.

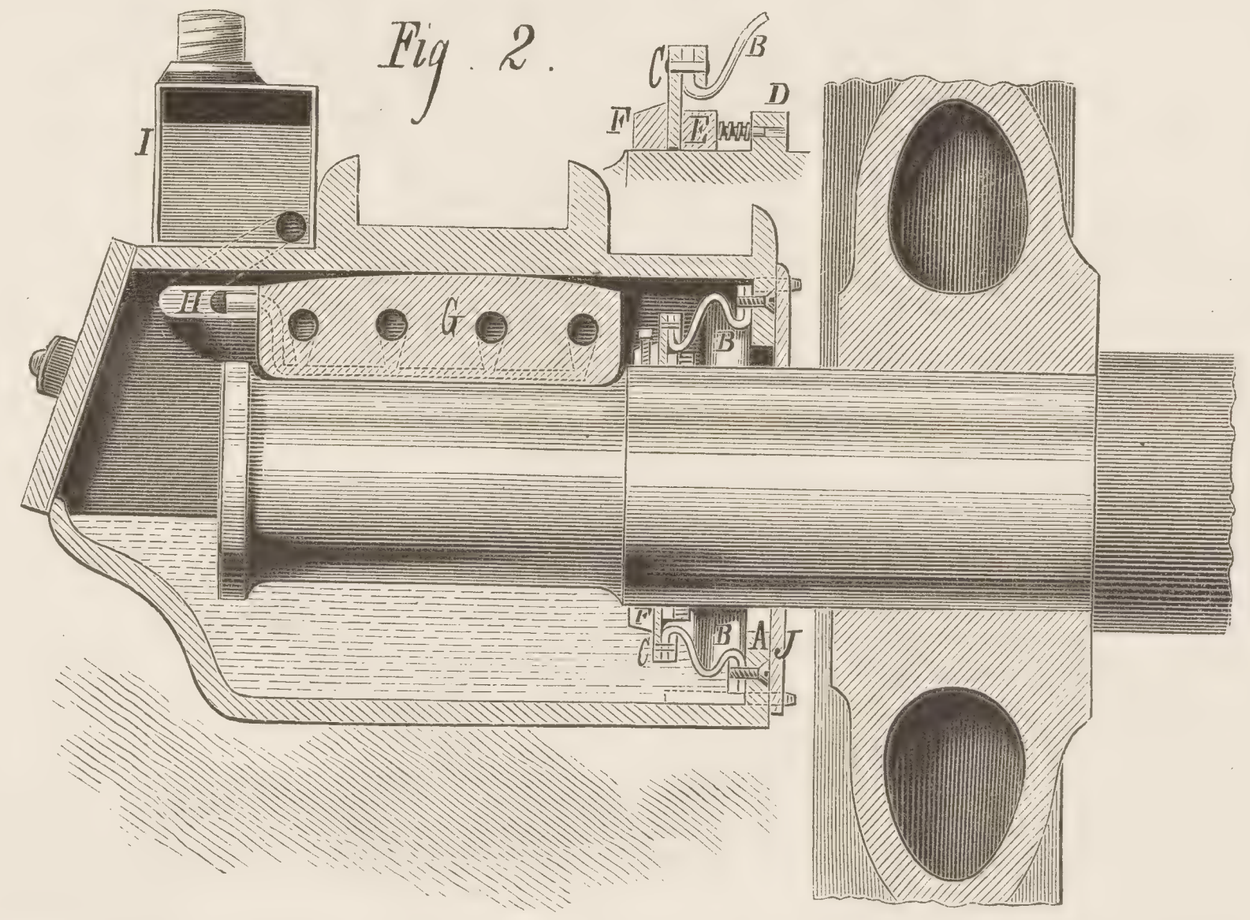
Fig. 1.



This arrangement, the inventor states, can be applied to any railway-box at a cost not exceeding fifty cents. He claims that it allows of filling the box to a sufficient depth with oil alone, and thus doing away with packing entirely, so that the axle runs directly in the liquid. A large saving is thus effected, not merely by preventing waste of oil, but also in packing, and the time and labor involved in inserting and removing the same.

The apparatus for cooling the journal consists in the peculiar construction of the brass, and in a water receptacle with suitable connecting pipes secured above and outside the box. The brass, shown at G, in the sectional cut, is cast with a core, so as to leave within it longitudinal and horizontal channels on each side of the brass. These connect with short tubes on the outer end of the brass; and to the tubes, the flexible rubber pipes, H, which lead to the water reservoir, I (shown in the perspective view, Fig. 1), are attached. It is claimed that, by this device, the brass can never become heated higher than the boiling-point of water, even if the lubricating material should be neglected. The reservoir is a simple box of tin, provided with a screw cap, opening to allow of its ready replenishment. It is attached to the box by a simple thumb-screw, so that if broken it may be easily detached. Its cost, the inventor says, need not be over ten cents, while the brasses, he further adds, are no more expensive than those ordinarily employed. In winter the water can be mixed with alcohol or glycerine to prevent freezing.

Fig. 2.



As an additional precaution against dust, a piece of leather, J, Fig. 2, is attached to the rear of the box by clamps.

The entire device is quite simple, and, as we have already stated, can be readily applied to trucks already in use. If its use in addition yields even a portion of the many important advantages claimed, its economical value will be quickly appreciated. Any road desiring to make a trial of the device, can have it applied free of charge by conferring with the patentee.

For further particulars address the patentee, Mr. C. A. Hussey, care of the Mercantile Agency, 335 Broadway, New-York City.

THE Baldwin Works, Philadelphia, have twenty-two locomotives now in progress for South-America.

Iron and Steel Rails.

THE annual report of the American Iron and Steel Association contains the following statement of the net tons of rails produced in the United States in 1873 :

New iron rails over 40 pounds	291,427
New iron rails under 40 pounds	25,739
Old rails rerolled over 40 pounds	408,089
Steel-headed rails over 40 pounds	26,377
Street rails	9,430
Bessemer steel rails	129,015
Total	890,077

Of this quantity, two thirds were produced in the States of Pennsylvania, Ohio, and Illinois. The large quantity of steel-headed rails produced in 1873 will not escape notice, These were principally Nes silicon rails made by the Elmira Rolling-mill, the New-Jersey Steel and Iron Company coming next with a large product of rails capped with puddled steel. The St. Albans, Springfield, Sandusky, and the Pottsville mills each made small quantities. The Reading and the Scofield mills each made steel-headed rails in 1874. The rails made at the latter mill are produced by a newly patented process, of which Messrs. Louis Scofield & Co. are the proprietors. The invention comprises the making of steel as well as steel-capped rails. It is claimed that by this process rails can be made at an additional cost of four dollars a ton, guaranteed to wear twice as long as the iron rail ; having a perfect steel cap on an iron base with a perfect weld. These rails it is also claimed can be rerolled as easily as iron rails. The Mobile and Montgomery Railroad Company have taken 1000 tons of them.

The consumption of steel rails in 1872 and 1873 is stated as follows, in net tons :

	1872.	1873.	Total.
Production	94,070	129,015	223,085
Importation	149,786	159,571	309,357
Total	243,856	288,586	532,442

The consumption of iron rails during the same period was as follows, in net tons :

	1872.	1873.	Total.
Production	905,930	761,062	1,666,992
Importation	381,064	99,202	480,266
Total	1,286,994	860,264	2,147,258

In 1873 the consumption of steel rails increased 44,730 tons over the consumption of 1872, while the consumption of iron rails decreased 426,730 tons. The net decrease in consumption was 382,000 tons.

The importation of old rails fell off greatly in 1873, and in 1874 was merely nominal. Accurate statistics are wanting, but in 1873 the importation did not exceed 50,000 net tons, and in 1874 it was about 5000 tons.

The report estimates our total production of rails in 1874 at 450,000 net tons ; our total importation, mostly steel rails, at 100,000 tons ; our total consumption at 550,000 tons ; and the number of miles of railroad built at 1900. The average price of best iron rails at Philadelphia during the year was $58.75.

In 1872 the production of rails in this country aggregated 1,000,000 net tons ; in 1868 it aggregated 506,714 net tons—doubling itself in five years. In 1872 the production of pig-iron in the United States was 2,854,558 net tons ; in 1867 it was 1,461,626 tons —almost doubling in six years.

The comparative cheapness of Bessemer rails and their excellent qualities have combined to make them very popular with railway companies in this country. As shown above, our total production and importation of steel rails in 1872 was 243,856 net tons, and in 1873 it was 288,586 tons. These totals were supplemented by the production and importation in 1874 of over 200,000 net tons, making a grand total of more than 700,000 tons of steel rails laid in the last three years. In view of the general use of Bessemer rails, one of the problems that now confronts the iron interest of this country is the future of iron rails. The demand for them has been lessened greatly by the demand for steel rails. Without undertaking a solution of the problem presented, we may instance some of the elements which will influence that solution. Steel rails are desirable in high latitudes, because the intense cold of winter does not break them so easily as it does iron rails. Their wearable qualities have been so fully tested that there is no doubt that one steel rail will outlast two of the best iron rails now made ; hence, where there is much traffic upon roads with heavy grades, or short curves, or even straight and level tracks, their use will always be general. In behalf of iron rails it may be said that they are now being made in American mills of a quality much superior to that of many rails formerly made ; that they will always be procurable at a price probably thirty-three per cent cheaper than steel rails ; that they will wear satisfactorily for many years upon roads having light traffic ; that most branch roads, or "feeders," will be well served by them ; that in the Southern States they will not be affected by frost ; and, finally, that all new roads, wherever situated, will probably be laid with iron rails until a business is developed that will justify the increased expense of laying steel rails. With the increase in the construction of new railroads, which is expected to follow closely upon the restoration of the financial confidence that the country now lacks, we look for an improvement in the demand for iron rails, and with the addition to the financial strength of trunk lines now in operation, which this restoration of confidence will also promote, we look for a continued increase in the use of steel rails.

An Injunction against Car Manufacturers.

A DECREE has just been signed by Judge Woodruff, of the United States Circuit Court of the Northern District of New-York, in a suit involving the validity of eleven patents covering different parts of street-cars. The decree grants a perpetual injunction against the manufacture of street-cars by John M. Jones & Co., and orders an accounting with the plaintiffs, John Stephenson & Co., which is set down for the 11th March, before Judge Mason, in Utica.

The idea of street railways was first put into practical operation in New-York City in 1831 by the construction of the New-York and Harlem Railway. John Stephenson, who is now the largest manufacturer of street-cars in the world, had then just completed his apprenticeship in the business of manufacturing the different kinds of omnibuses, and had started in business for himself. He was employed by the New-York Railway Company to design and construct their cars. The first one finished was called the John Mason, and being a novelty, a patent was taken out on it. Since that time the idea of tramways has been adopted in almost every civilized country, and almost everywhere that a tramway is to be found, Stephenson's cars are running on it. As the business of manufacturing increased, the different parts of the cars became the subjects of a large number of patents, many of which are on Mr. Stephenson's own inventions, and the most of which are now owned by him, he being now the sole proprietor of over fifty patents. These patents have nearly all been infringed upon by many of the street-car manufacturers in this country, and the patentee has determined to enforce his rights. The suit which was commenced in 1873, and has now been carried to a successful termination, is the first one brought in pursuance of this resolution.

The complaint, presented by the plaintiff's attorney, Louis W. Frost, Esq., describes the eleven patents which cover : 1. A non-explosive lamp, consisting of a reservoir containing the oil, in which is set a well, tightly stuffed with wick. The oil has access to the wick only through a small hole in the well. Oscillation of the oil and consequent explosion are thus obviated. 2. The lamp-box, the form of which is familiar to all passengers. 3. An improvement in bracing and trussing the car. 4. The lever door-handle. This shuts and latches, or unlatches, and opens the door with a single motion. 5. An improved running-gear. 6. The new form of elevated and ventilating roof. 7. The new form of platform, with appendages. 8. An improved wheel-box. 9. The colored signal-lights for distinguishing cars of different lines. 10. The double way, upper and lower, on which the doors run. 11. Improved axle-box, pedestal, and base-plate.

The amount named in the prayer for relief, presented with the complaint, is $100,000, but the actual amount to be recovered will depend on the accounting before Judge Mason.

Railroad Purchasing Agents' Association.

THE second annual meeting of this association will be held at the Lindell Hotel, St. Louis, on the 12th of May next. The first meeting was held in June last, at Chicago, when the organization was completed and the following rules and regulations adopted :

"This Association shall be known as the Railroad Purchasing Agents' Association of the United States and Canada.

"It shall have for its objects the interests of the railroads represented by its members, promoted by mutual acquaintance and counsel, and shall have the following officers : one president, two vice-presidents one secretary and treasurer, and an executive committee of three.

"Said officers shall be elected at each regular annual meeting, and hold their respective offices for one year, or until their successors are elected. They shall, with the exception of the Executive Committee (whose duties are hereinafter defined), be governed in their duties and positions by such general rules and regulations as pertain to like offices in similar bodies.

"The duties of the Executive Committee shall be to examine all bills against the Association, and, if proper, approve the same and order their payment ; to determine the amount of and order assessments to meet the expenses of the Association, and to act, in conjunction with the President, upon any matter of interest coming up between the annual meetings.

"At the written request of five members at any time, the President shall call a special meeting of the Association, to be held at the place appointed for the next annual meeting.

"The expenses of the Association shall be met by an assessment upon its members, made by the Executive Committee, and to be paid to the Secretary and Treasurer.

"Any Purchasing Agent of any railroad in the United States or Canada may become a member of this Association by signing these rules and regulations.

"Any alteration of these rules and regulations may be made at an annual meeting, by a two-thirds vote of the members present."

The officers of the Association are as follows :

President, G. C. Breed, Louisville and Nashville and Great Southern ; First Vice-President, William S. Cuddy, St. Louis, Iron Mountain and Southern ; Second Vice-President, J. T. Sterling, Toledo, Wabash and Western ; Secretary and Treasurer, John B. Gallaway, Memphis and Charleston ; Executive Committee : J. W. Morse, Indianapolis and St. Louis ; H. C. Becker, St. Paul and Pacific ; E. V. Cherry, Indianapolis, Cincinnati and Lafayette.

The object of the organization is to promote the interests of the roads represented by it, by mutual conference and interchange of ideas. The initiatory meeting last year was entirely harmonious and satisfactory. A full attendance is expected at the meeting to be held next month, when some important action is anticipated.

THE Connellsville Car and Machine Company have recently enlarged their works, so that they are prepared to furnish all kinds of railroad-cars and railroad machinery and castings.

Important Discovery.

THE Baltimore *Sun* of March 13th says that "during the past two days there have been interesting exhibitions at the machine-works of Messrs. Denmead & Co., in this city, of a most important process in the working of steel; that is, the burning and restoring and the welding of steel by Beazell's patent. By no known process heretofore has steel been perfectly welded or restored when destroyed, yet the theories and practice, in this regard, appear to be overthrown by the exhibition made at the shops of Denmead & Co., where intelligent parties of gentlemen have been called by the agent of the patentee to witness the process of the best steel being utterly destroyed by burning, and then again perfectly welded, or fused and made, in one instance, into a cold-chisel, which was then used immediately to cut the bar of steel from which it had been made. Experts upon the spot appeared to be quite astonished and pretty well satisfied with the results. Steel generally is destroyed by burning to a white heat, and is unfit for use afterwards. Any process by which it can be reworked must be of great value, bringing the material of worn articles and scraps into use again. The important discovery in this patent is the use of a flux in reworking the metal, consisting of caustic soda. It was stated that the patent-right had already been sold for New-England."

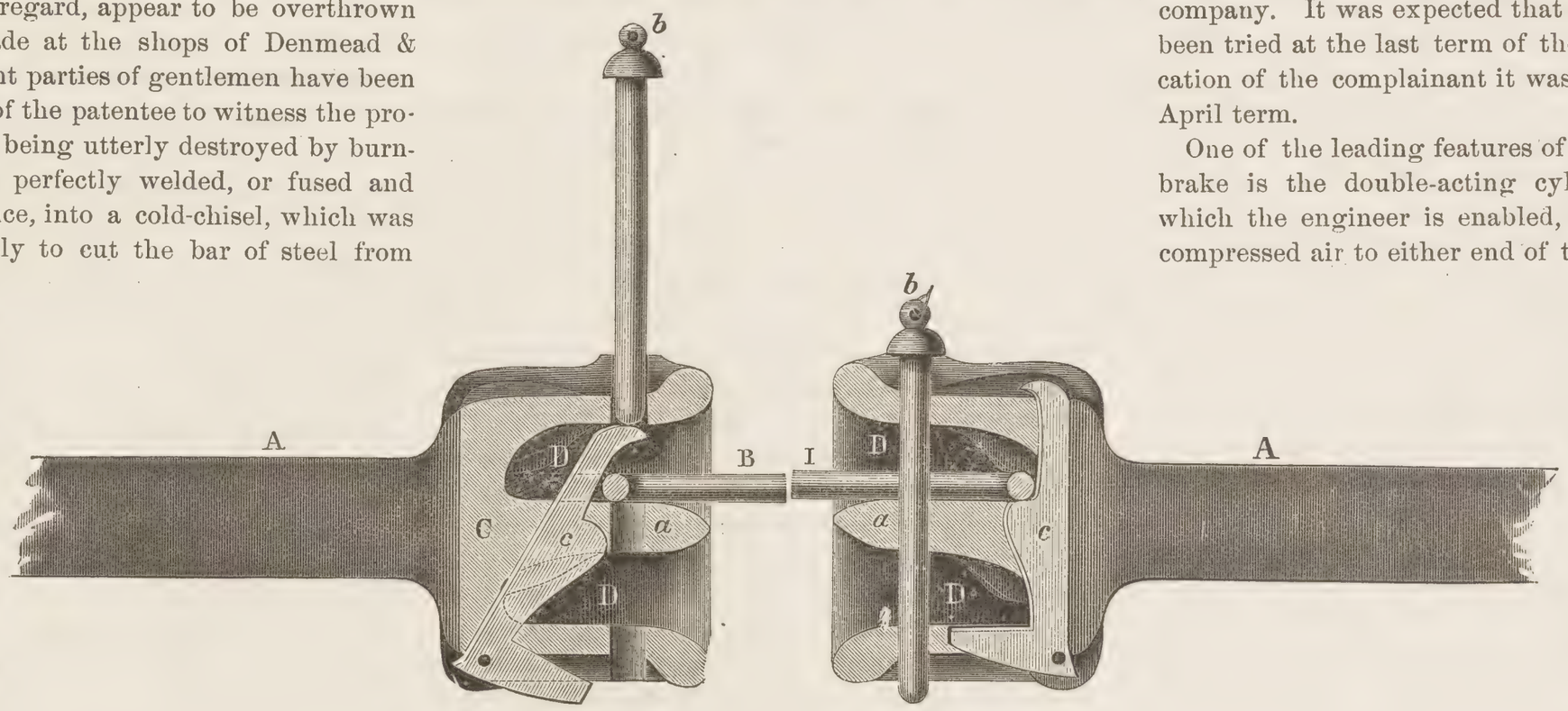
Cutting Steel Rails Cold.

THE cutting of a file in halves with soft iron was an old lecture experiment. The soft iron formed a disk about six inches in diameter, was mounted on a lathe-spindle, and run at about 2000 revolutions per minute. A file held to the edge of the disk was cut in two in about ten or fifteen seconds, the disk being unharmed. The shower of sparks rendered this a brilliant experiment, very popular with a general audience. The principle involved is now being applied to a practical purpose. Mr. Charles White, manager of Sir J. Brown & Company's Works, Sheffield, has found the cost of cutting off the ends of steel rails cold in the ordinary way so enormous that he resolved to try another expedient. For experiment, he had an ordinary rail-saw put in the lathe, and all the teeth cut off. The revolving disk was then mounted on a spindle and driven at nearly 3000 revolutions a minute. The disk was three feet in diameter, so that its circumferential velocity was about 27,000 feet, or over five miles a minute, or 300 miles an hour. Steel rails forced against the edge of this disk were easily cut through in three or four minutes each. The rails weighed 65 lbs. to the yard. Sparks flew in abundance, and the disk appeared to melt the rail before it; but after cutting five rails, the disk itself was not sensibly warm. The experiment was such a complete success that the firm intend putting up a very powerful saw for the purpose of cutting cold steel rails.—*Ironmonger.*

RIEHLE BROTHERS, proprietors of the Philadelphia Scale and Testing-machine Works, have recently furnished the Cambria Iron Co., Johnstown, with a testing-machine of 150,000 lbs. capacity, for testing the tensile and crushing strains of iron, etc., of almost any length.

The National Freight-Car Coupler.

THIS coupler is not a recent invention. It is now in use, and has been for two or three years past, on several New England roads, where it seems to give good satisfaction. The cut shows its construction and operation. The trip, *c*, drops forward from its own weight and sustains the pin in readiness for coupling, while the link of the opposite draw-head strikes and pushes it back so the pin can drop. The upper and lower sections of the draw-head are adapted to cars of different heights, and avoid the necessity of using crooked links. The device is a practical self-coupler, in which the link and pin are recognized as the only safe, effective, and economical means of coupling cars, all accessories in the way of springs, followers, etc., being dispensed with. As an evidence of its appreciation by parties familiar with its working, a gold medal was awarded to the proprietors by the Massachusetts Charitable Mechanics' Association, at their fair in Boston, in September last. It is manufactured by the Raddin Manufacturing Co., Lynn, Mass



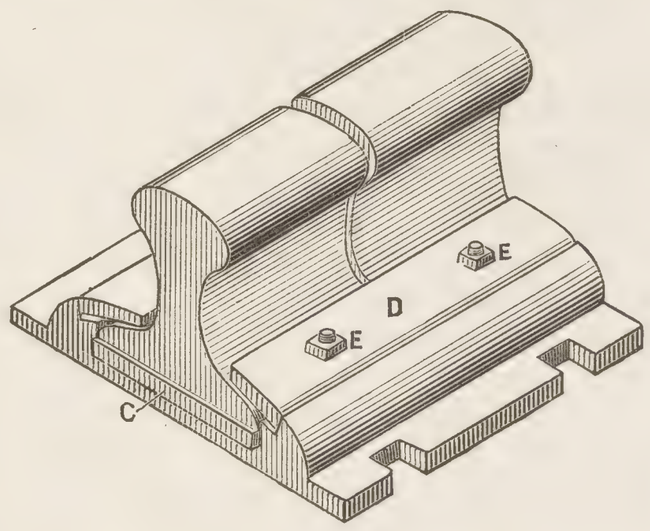
Raddin's Elastic Rail-Chair.

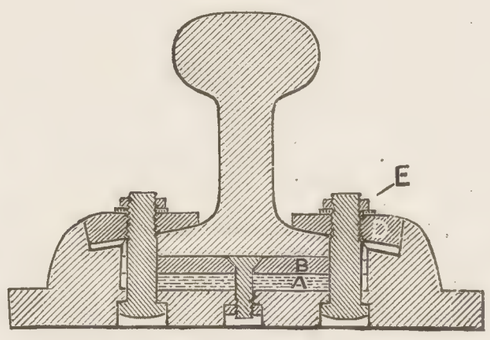
THIS chair is provided with an elastic cushion, *A*, securely compressed to the chair-bed by a covering-plate, *B*, firmly bolted thereto, and provided with downward-projecting lips, *C*, to prevent the horizontal play of the cushion. The abutting ends of the rails rest upon this covering-plate, and are secured to each other and to the chair by the plates *D* and bolts *E*. The advantages claimed for this construction are as follows:

1st. Preventing the hammering by the wheels in passing from one rail to the next, by absorbing the shock, and also displacement of the road-bed, thus giving an equal bearing on each sleeper, and making the rail continuous.

2d. The rubber-packing prevents undue wear of the rail-ends, and the loosening of the bolts, and the constant vibration so destructive to rolling-stock, consequently lessening the rattle and jar of passing trains.

Further information may be obtained by addressing John Raddin, Lynn, Mass.





An Important Power-Brake Suit.

A CASE of considerable importance to railway companies, and indirectly to the general public, has been pending for some time in the United States Circuit Court at Cleveland, Ohio. It involves the validity of the power-brake patents held by the Westinghouse Air-Brake Company and the Gardner-Ranson Air-Brake Company, the complainant being Mr. George Westinghouse, Jr., and the defendants the last-named company. It was expected that the case would have been tried at the last term of the court, but on application of the complainant it was continued until the April term.

One of the leading features of the Gardner-Ranson brake is the double-acting cylinder, by means of which the engineer is enabled, by the application of compressed air to either end of the piston, to release the brake instantly from the wheels, whether the power is only partially applied for the purpose of slacking or steadying the train, or applied with full force for the purpose of stopping; and in this important particular the brake is claimed to be as efficient upon long trains as on short ones. Whether the inventors of the device can furnish this new feature in connection with a continuous train-brake, without infringing the Westinghouse patents, is the main question to be determined by the suit.

Improved Freight-Car Construction.

THE Pittsburg Car Works announce an improvement in the construction of freight-cars, by which greater strength and durability are secured, as well as capacity for carrying more paying freight in proportion to dead weight. The longitudinal sills consist of a beam of wood, fitted and bolted into the channel of a bar of channel-iron, the number of these sills being determined by the size and capacity of the car. They are constructed so as to afford the greatest resistance to vertical pressure, with the least weight of material; and by replacing the wood when decayed, the usual cost of repairs is very much reduced. The body-bolster is composed of two pieces of the same kind of iron, bolted back to back, and united by through-bolts, which pass through washers placed between the pieces to keep them from close contact. These bolsters are firmly united to the sills or stringers. The truck-bolsters are of wood and iron, combined in the same way as in the sills, the central part being wood.

The pockets for receiving and holding the vertical brace, and the two diagonal braces of each set of such braces throughout the car, are made of cast-iron, and are bolted to the outside of the side-sills. Each of these pockets contains a central recess for the vertical brace, and on each side of the recess, a skew-back, for the foot or lower end of each of the diagonal braces. The tops of the braces, instead of coming directly against the wood of the roof-timber, may rest against a channel-iron interposed between them, which gives the sides and body of the car great rigidity.

The aim of this method is to substitute iron for bearing purposes, using wood only for construction.

EVERY passenger-car on the Illinois railroads is by law compelled to be furnished with a woodman's axe, sledge-hammer, a hand-saw, and two leather buckets.

The Present Status of Railroads—Is it what it should be?

BY J. M. BLANCHARD.

THE great value of railroads to the people of this country, their influence on the prices of products and manufactures, the vast amount of capital invested in them, the growing antipathy to them among certain classes of our people, and the high order of talent enlisted in their management, would seem to justify the inquiry above suggested. When the history of the railroads of the world shall be written, it will surpass in thrilling interest and adventure any fiction ever published, and, in a financial and economical point of view, will exceed any work on political economy now extant.

The writer has neither the time nor the ability for such an undertaking; but having given much attention in past years to the construction and operation of railroads, it is proposed in this article to embody some of the results of his observations, having reference mainly to their status as the carriers of products and passengers, and the feasibility of their improvement for such purpose. Ever since the proposed employment of steam locomotive power upon railroads, they have been the subjects of criticism and even ridicule by men in high positions whose lack of knowledge was more prolific of surmises than statements of fact. Railroads have nevertheless been pushed forward to such a degree of completeness as to render them indispensable for carrying purposes. These enterprises have been directed in most cases by persons endowed with rare natural talents, and often possessing an acquired knowledge unsurpassed by any like number of persons engaged in any other department of business. If errors have been made, it is because in railroading, more than in any other kind of business, theoretical reasoning is found to be at fault when reduced to practice. The original theory, for example, that locomotive driving-wheels would not adhere to the rails, much less draw a load after them, was not only advanced by practical men, but was urged by the learned and scientific. Experiment became necessary to disprove such theories; and ever since Stephenson's day, the theories of those who assumed to be teachers have quite as often been wrong as right. Their correctness has had to be determined by practical test; and this has applied to almost every thing pertaining to construction and operation—the material and form of rails, character of road-bed, weight and style of engines and cars, and a thousand minor details. In respect to these, a great diversity of opinion very properly exists, for the reason that what is adapted to the circumstances and conditions of one road is not equally so to another. It would be quite an easy matter for an engineer to construct a road and determine the character of its rolling-stock, could he know in advance the amount of tonnage to be transported, the number of trains per day, and especially if these were not to be increased or diminished, or the rate of speed changed. If he erred very materially under such circumstances, he would justly be deemed an incompetent. But when he is required to build and equip his road with the least possible present expenditure, so as to adapt it to its present business and also to its increased business ten years later, the problem assumes a more difficult form, and if he should fail in its solution, it would not necessarily be an evidence of incompetency.

To illustrate one of the false theories which we have had to combat in this country, the writer will relate a personal reminiscence. He received in 1844 the position of locomotive engineer on a new road in the interior of the State of New-York, a position about as difficult of attainment then as that of a Congressman is now. An intimate friend was one day in the company's office, and seeing an engine with a single pair of driving-wheels standing on the track near by, remarked that he had just returned from Europe, where he had seen many engines with four drivers, and then asked if there was any advantage in having that number. The president of the road, who was present, replied, "Oh! yes, there is a great advantage, and if that engine (pointing to the one referred to) had two pairs of drivers, she would draw just twice as much as she does now; and if she had three pairs, she would draw nearly three times as much!" It is hardly necessary to say that I took an early opportunity to undeceive him, and it has often occurred to me since, that if presidents of railroads are liable to be so far wrong in their theories, it is no great wonder that subordinates also should sometimes make mistakes.

It seems but just, therefore, to say, that the present status of American railroads is that of a great and powerful agent in the advancement of the moral and physical well-being of the people, and exercising a controlling influence in the arena of finance and politics. But they are not yet in their construction and management all that they should be. The active managers of our roads are, as a rule, overworked, and owing to this they can not pursue many important investigations that they might otherwise do; their attention is demanded for so many frivolous matters that they are liable to become apathetic in regard to those of higher importance; and they are also required to be familiar with a mass of details and to give opinions upon matters of grave importance at an hour's notice. This is too much to devolve upon any one man, and can only be remedied by a proper division of labor and more thorough proficiency in the hands of each subordinate department. Then again, there is no system of training by which aspirants for these positions can acquire the necessary education to fit them for their special duties; but, on the contrary, the incumbents are apt to be selected for some supposed capacity for learning the business, or from considerations of influence or favoritism. The result is that they find themselves in positions the responsibilities of which they are not equal to, and the service suffers in consequence. It can hardly be denied that a preparatory education is as necessary for the filling of responsible positions in railway service as for those in the army and navy.

Another great hinderance to progress in the line indicated, seems to consist in the fact that there is not a proper diffusion of the knowledge acquired by the experience of practical men. The idea seems to prevail that each separate fact acquired is the property only of the parties discovering it, rather than of the whole fraternity; and hence it follows that many really valuable improvements which have been made and adopted by the managers of certain lines, have not for years been known beyond the limits of such lines, or their immediate connections. It is believed that if a different policy were adopted in this respect, and a Bureau of Information established in some place accessible to all interested, and to which all facts, as fast as proven to be such, were communicated, to be by them recorded, and if necessary published, there would be such a diffusion of knowledge as would be of great service to all who are engaged in railroad management, and especially to those commencing to learn the business. Another, and as it seems to the writer, the greatest hindrance to true progress in the direction indicated, is the absence of devices for testing the correctness of theories held by different persons. For instance, the discussion that has recently taken place as to whether what is termed the "standard car-axle" would, with an equal amount of weight resting upon it, cause more friction than one with smaller and shorter journals, shows that so simple a proposition as that seems to be, is not settled to the satisfaction of all parties. Now it is a fact that for a small sum of money expended in the construction and application of a suitable dynamometer, this question can be settled beyond all cavil. Let such an instrument be put between a train of cars having the axle referred to and the engine which draws them, and then let another train of equal weight be substituted, and let it be drawn by the same engine over the same route, a record being kept in both cases of the entire expenditure of power, and the question would be settled.

Again, there is a great diversity of opinion as to the relative economy of different kinds of fuel. This same instrument could very conveniently be used to test and settle all questions of this character, as the work done by a ton of coal or a cord of wood could be as accurately weighed out by it as a pound of sugar can be weighed by the grocer's scales.

Standard Sizes of Steam, Water, and Gas-Pipes.

THE manufacture of wrought-iron pipes and fittings for water, steam, and gas distribution, has grown to such a magnitude as to take its place among the leading industries of the age. The great and increasing demand for them requires that the numerous details with respect to sizes and interchangeability of parts should be thoroughly classified and reduced to a system, as a matter of saving economy both to manufacturers and consumers; and this has already been done to an extent which leaves little margin for improvement. It has had the effect of suggesting, in machine-shop practice, many advantages to be derived from similar methods, and is probably the origin of the standard sizes of screw-threads, bolt-heads, and nuts.

The use of pipe for car-work has, of late years, very much increased by the introduction of air-brakes, water and steam heaters, gas, etc., to say nothing of its prospective employment in car-frame construction. We have, in view of all this, and for the convenience of our readers, compiled from various sources the following table, showing the sizes of threads and pipes, which, from some inadvertence, appears to have been left out of the hand-books of the day.

Inside Diameter.	Number of Threads per inch of Screw.	Actual outside Diameter.	Thickness. Extra Strong.	Thickness. Double Extra Strong.	Actual Inside Diameter. Ordinary Strength.	Actual Inside Diameter. Extra Strong.	Actual Inside Diameter. Double Extra Strong.	All Strengths of Pipe. External Circumference.	All Strengths of Pipe. External Area.	All Strengths of Pipe. Length of Pipe per square foot of *outside* surface.	Ordinary Strength of Pipe. Internal Area.	Ordinary Strength of Pipe. Length of Pipe per square foot of inside surface.	Ordinary Strength of Pipe. Length of Pipe containing one cubic foot.	Ordinary Strength of Pipe. Weight per foot.
Inches	Th'ds.	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Feet.	Inches.	Feet.	Feet.	Lbs.
⅛	27	0.405	0.068	0.100	.....	0.270	0.205	1.272	0.129	9.44	0.0572	14.15	2500	0 243
¼	18	0.54	0.088	0.123	....	0.364	0.294	1.696	0.229	7.075	0.1041	10.50	1385	0.422
⅜	18	0.675	0.091	0.127	.....	0.494	0.421	2.121	0.358	5.657	0.1916	7.67	751.5	0.561
½	14	0.84	0.109	0.149	0.298	0.623	0.542	2.652	0.554	4.502	0.3048	6.13	472.4	0.845
¾	14	1.05	0.113	0.157	0.314	0.824	0.736	3.299	0.866	3.637	0.5333	4.635	270.	1.126
1	11½	1.315	0.134	0.182	0.364	1.048	0.951	4.134	1.357	2.903	0.8627	3.679	166.9	1.670
1¼	11½	1.66	0.140	0.194	0.388	1.380	1.272	5.215	2.164	2.301	1.496	2.768	96.25	2.258
1½	11½	1.9	0.145	0.203	0.406	1.611	1.494	5.969	2.835	2.01	2.038	2.371	70.65	2.694
2	11½	2.375	0.154	0.221	0.442	2.067	1.933	7.461	4.430	1.611	3.355	1.848	42.36	3.667
2½	8	2.875	0.204	0.280	0.560	2.468	2.315	9.032	6.491	1.328	4.783	1.547	30.11	5.773
3	8	3.5	0.217	0.304	0.608	3.067	2.892	10.996	9.621	1.091	7.388	1.245	19.49	7.547
3½	8	4.0	0.226	0.321	0.642	3.548	3.358	12.566	12.566	0.955	9.887	1.077	14.56	9.055
4	8	4.5	0.237	0.341	0.682	4.026	3.818	14.137	15.904	0.849	12.730	0.949	11.31	10.728

In estimating the effective steam-heating or boiler surface of tubes, the surface in contact with air or gases of combustion, whether internal or external to the tubes, is to be taken. For heating liquids by steam, superheating steam, or transferring heat from one liquid or gas to another, the mean surface of the tubes is to be taken. It is impossible to make iron tubes of exact internal diameter. All pipes of 1¼ inches diameter or less are butt-welded and proved to 300 lbs. hydraulic pressure; 1½ inches diameter and

above, are lap-welded and proved to 500 lbs. per square inch. The taper of all threads, 1 to 32 on each side, equal to $\frac{1}{16}$ per inch of length.

Improvement in the Block System.

AT the last meeting of the British Association an improvement in the block system of managing railroads was described. The old method of running trains was to allow a certain length of time to pass before one train could follow another; but if the forward train became disabled, there was great danger that the next one would run into it before it could be signaled. The block system differs from this in having the road marked off in definite lengths or block-sections, into which one train is not permitted to enter until the preceding one has passed out. Safety is thus secured by leaving a sufficient interval of space. This is the ground principle of the new plan, but great advantages have been gained by collecting all the signals, switch-levers, and other means of operating the line, into large signal-stations placed at every alternate block-section. This station consists of an elevated building with large windows from which the line can be observed. Signals are transmitted by electricity, and the apparatus is so arranged that it is almost impossible for the signal-man to put a signal in such a position as would endanger a train without previously placing the necessary danger-signals to warn the engineer of the train. The last improvement in this system has been applied on the Caledonian Railroad in Scotland. On most roads the danger-signals are usually down, and are raised only when required. The improvement is to keep these signals always up, so that the road is permanently closed to the on-coming train until the signal-observer telegraphs that all is right. The advantage of this is that in case of negligence or accident preventing the signal-man from doing his duty, the train can not proceed, for the road is closed. A further safeguard consists in the fact that when a train passes, the observer attached to the section on which it is running must telegraph to the man next ahead to notify him of the fact. This man then telegraphs to the next observer to ask if his section is clear, and not until he receives answer that it is so can the train leave the section it is on. Thus three signal men are involved in permitting a train to pass from one section to another.

Speed of Trains and Weight of Rolling-Stock.

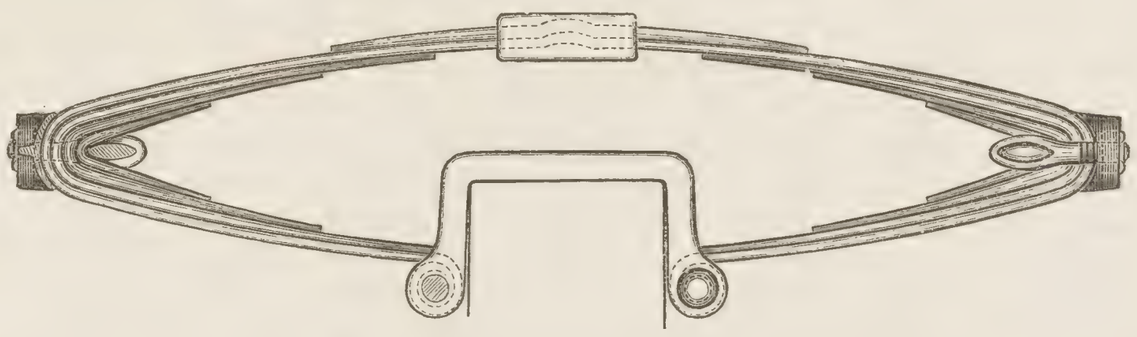
THE current report of the Railroad Commissioners of Maine contains suggestions in regard to reducing the speed of trains and the weight of rolling-stock on railways, to the end of diminishing the wear and tear of the latter and of the track. In a communication from Superintendent Sawyer, of the St. Croix and Penobscot Railroad, that officer writes:

"With two engines in equally good repair, we ran one at a speed of 26 miles an hour, 42 miles daily, with a mail train, and at a speed of 14 miles an hour daily with a freight train; total, 84 miles daily until it had run 14,000 miles, when it became necessary to take it off for general repairs. The other ran 84 miles daily at a speed of 14 miles an hour, with a freight train, until it had run 21,000 miles before requiring general repairs, and was even then found in better condition than the one running at the higher rate of speed. Wood and oil were consumed nearly in the same proportion. It is fair to suppose, also, that the rails, sleepers, bridges, etc., suffered the same additional wear. It is my opinion that an increase of speed of 12 miles an hour, beyond 14 or 15 miles, will increase the cost of repairs at least 75 per cent.

"In relation to wheels, I think that at a low rate of speed a 350-pound 28-inch wheel is more than equal to a 500-pound 32-inch wheel at a high speed before a light one will become unsafe with the same number of miles run at low speeed. A 25-ton engine is of sufficient weight for general use. If additional power is required with a snow-plow on heavy freights, rather increase the number of engines than the weight of them; there is less risk in moving snow with power and force than with momentum. As to passenger-cars—a fifty-seat passenger-car can, in my opinion, be run more economically than the ordinary car. The first cost is $1000 less, the weight and wear on the rails are less, the cost of repairs is less, and it requires less power to move six fifty-seat cars than it does to move five sixty-seat cars, there being a difference of 18 tons in favor of the six light cars."

An Elliptic Spring for Street-Cars.

THE cut illustrates a modification of the Cliff Elliptic which makes it applicable to street-cars. The occupants of these vehicles have hitherto been deprived of the advantages of elliptic springs, so indispensable for easy riding, because their height as ordinarily constructed has been too great for the space in the pedestals. This obstacle, however, has been overcome by the method shown in the cut, which could not be applied to the old style of elliptic, but is easily adapted to the Cliff pattern. It consists of a stirrup fitted to the axle-box and forming a part of the lower half of the elliptic, the centre-band or plate being attached to the stirrup on each side by key-bolts. This arrangement does not impair the strength or interfere with the natural action of the spring, while it makes it available for a service in which it is greatly



needed. The springs generally used on horse-cars are either solid rubber or steel spirals, or the two in combination. These are sometimes placed directly over the journals; but more frequently they are set vertically and supported on each side of the journal-box by a saddle. Under this latter arrangement, the height of the springs is usually disproportioned to their diameter, causing them, under the strain to which they are subjected in stopping and starting, to "buckle" or get out of perpendicular line, in which case their action as springs, always hard, jerky, and rigid, is very much impaired, and the riding made disagreeable to passengers in a corresponding degree.

All this is, in a great measure, obviated by applying the elliptic element as shown in the engraving. In order to test the capacity and superiority of this form of spring for street-car purposes, a set of them has been placed under one of the cars of the Grand-street line, in this city, where they have been running for a number of days with the most satisfactory results. The usual jarring and thumping caused by the inequalities of the track and the passing of frogs, switches, and turn-outs, are almost entirely neutralized, and a degree of comfort secured to passengers similar to what is experienced on steam-cars. The springs, when properly applied and adapted to their work, preserve their elasticity and full range of action, and can not get out of position. The usual saddle for supporting rubber and spiral springs, together with the necessary bolts and nuts, are dispensed with; there is less liability of breakage; and in case a break does occur, it can be repaired without sacrificing the entire spring. A set of four springs costs only $16, and they can readily be applied to any ordinary horse-car. Their general adoption will prove a measure of economy for street-car companies as well as a boon to passengers, not by enabling the latter to realize at once their cherished ideal of rapid transit, but by mitigating to a very considerable extent the discomforts of the present method.

Communications may be addressed to the manufacturers, Vose, Dinsmore & Co., 32 Warren street, N. Y.

THE Pennsylvania Railroad Company is to build an immense hotel on Stewart and Elm avenues, Philadelphia, for the accommodation of visitors to the Centennial. It will contain a dining-room 170 x 210 feet, and capable of seating 1200 persons; a restaurant 50 x 239 feet; a waiting-room 170 x 200 feet, and all the necessary parlors and reception-rooms. The hotel building will be 700 feet long, 254 feet wide, four stories high exclusive of basement, and will comfortably accommodate 2500 guests. While it is designed as a temporary structure to be removed at the close of the exhibition, it will be substantially built, warmed by steam, lighted with gas, and supplied with water throughout.

THE Cummings Car Works have just completed six new cars for the New-York Elevated Railway. Their general design is the same as those now used by the road, the bodies having a central depression between the trucks so as to bring the floor within six inches of the track. The centre of gravity is thus brought so far below the journal-bearings as to greatly lessen the liability to overturn. The new cars have an improved style of finish, of which the head-linings are a conspicuous feature; and they are also equipped with Cliff Elliptic Springs. They will be an important addition to the equipment of the road, rendered necessary by its increasing business. The above-named works are also building seven passenger-cars for the New-York and New-Jersey Railroad.

THE annual report of the directors of the Union Pacific Railroad shows the following results of operation in 1874: Gross earnings, $10,569,880.12; expenses, including taxes, $4,652,314.95; surplus earnings, $5,907,565.17, the operating expenses being 44.05 per cent of the gross earnings. The surplus earnings are equal to 7 per cent of the entire stock and bonds. Compared with the previous year, there has been an increase of gross earnings of $290,776.46, a decrease in expense of $390,897.41, and an increase in surplus earnings of $684,673.80. The ratio of expense to earnings has been decreased from 48.46 per cent to 44.05 per cent. The passenger earnings amounted to $3,952,858.55, and the freight to $5,664,731.38.—Upwards of 84 miles of new steel and iron rails have been laid the last year, and the entire track, together with the equipment and depots, has been maintained in high efficiency, the expenditures for which have been charged to the operating expenses.

THE Hoosac Tunnel is so far advanced toward completion that a single track has been laid through it, but it is not probable that passenger-trains will be allowed to pass for several months. The first train passed through the tunnel on the 9th of February, and was thirty-five minutes making the trip. Large amount of arching must be built before the tunnel will be secure against falling rocks.

A DECISION has just been rendered by the Supreme Court of Illinois that railroad sleeping-car companies do not incur innkeepers' responsibilities, and can not be held liable for the value of property stolen from passengers.

THE Car-Builders' Committee on the subject of Car-Wheels, Best Method of Fitting, Flange-Wear and Causes, etc., have just issued a circular containing thirty-three questions. Replies must be addressed to C. A. Smith, Secretary of M. C. B. Association, 113 Liberty street, New-York.

The National Car-Builder

PUBLISHED MONTHLY,

BY

VOSE, DINSMORE & CO.,

32 Warren Street, New-York; 52 Fifth Avenue, Chicago; 720 North Second Street, St. Louis.

JAMES GILLET, EDITOR.

Terms, $1.10 per Annum.

APRIL, 1875.

Editorial Announcements.

Correspondence.—*We cordially invite the co-operation of the railroad public in affording us the material for a good mechanical paper. Articles relating to rolling-stock and machinery, by those practically acquainted with those subjects, will be gratefully received. All communications must be addressed to Vose, Dinsmore & Co., No. 32 Warren Street.*

Advertising Rates.—*For one square, or one fifth of a column, $5 per month, or $50 a year. For half a square, $3 per month, or $25 a year. Larger advertisements by special contract.*

All communications in regard to advertising should be addressed to L. F. Dinsmore, *Post-Office Box 4055, New-York City, who is our agent for advertising, and authorized to make contracts, collections, etc.*

Engravings and Illustrations.

We would invite the attention of Master Car-Builders and others to the advantages to be derived from publishing in The National Car-Builder *engravings designed to illustrate the various features and details of car construction, and especially such improvements as can not otherwise be clearly presented. We will procure cuts to be made in the best manner from drawings or models that may be sent us, and charge only for the cost of engraving, inserting the same in our paper with suitable descriptive details, without charge.*

Railroad Reports and Statistics.

Our general railroad statistics are by no means as complete and reliable as they should be. This is not to be wondered at in the absence of any thing like system or uniformity in the time and manner of making reports, and especially when it is considered that railway companies have been regarded as mere voluntary associations, doing business on their own private account, and subject only to the regulations contained in their charters. In some States they are under no legal obligation to make reports at all, and even when such an obligation exists, there is no specific formula required with respect to details, and the exhibits are consequently such as the policy and financial exigencies of the particular road seem to require, without regard to the kind of information most eagerly sought for by the public. There has been at the same time no uniform method of keeping accounts, no system applicable to the business of all roads alike, so that a similar annual exhibit, embracing the same particulars, could be made by all. The result has been a great diversity in the character of reports, some being clear and comprehensive, while others are confused, meagre, and unsatisfactory, making it altogether impossible for the most industrious compiler to tabulate the items for generalization and analysis without resorting to estimates, conjectures, and approximations in order to fill up gaps and supply deficiencies. This is the way it has been in the past; but owing to the great prominence given to railroad affairs since the date of the great panic, and the desire for more information upon all points relating to their construction, operation, earnings, expenses, financial condition etc., it is more than likely that better and more satisfactory reports will be made in the future, even if the making of them is left to the voluntary action of the several companies. A controlling public sentiment, to say nothing of additional legislative requirements, will greatly contribute to bring about a reform.

The formation of Boards of Commissioners in several States, charged with the duties which railway companies have hitherto failed to perform, has already done much to improve the character of railway statistics; but any thing like completeness is not likely to be attained until some well-matured *form* shall be adopted for all railroad reports, so that the returns shall be substantially the same in all the States, such form to embrace every essential fact and detail, and omitting whatever is trifling and unimportant. In connection with this plan, however, and without which it would be to a great extent impracticable, there should be a more uniform and systematic method of keeping accounts. It is idle to talk of full and accurate exhibits of freight and passenger earnings, of construction and operating expenses, of the repairing, renewal, and condition of rolling-stock, mileage of cars and locomotives, cost of transportation, and numerous other details, unless the accounts are kept in such a manner as to be a reliable record of what is done in the various details of management.

To indicate how all this is to be accomplished is not the purpose of this brief article. It would seem, however, that a conference of the most experienced railroad managers in the country, in connection with the several State Commissioners, could elaborate a plan that would cover the whole ground, and with the necessary legislation, be carried into practical effect. A necessity for something of this kind is imperative, not only as a means for improving the general statistics of railroads, but for satisfying the scrutiny which will from this time forth be exercised with respect to the condition and management of these corporations. The advantages to be derived from more complete and thoroughly classified details pertaining to the mechanical departments would be appreciated by those in charge of them. The means would be afforded of determining many unsettled questions about the durability and economy of material, and the relative merits of different devices in regard to which there is so much present uncertainty and conflict of opinion. The railroads themselves would be vastly benefited in the way of ascertaining tangible results in a multitude of instances where such results can now be reached only in a blind, groping, haphazard sort of way. This is sufficiently illustrated by the experience of the several associations of railway men organized for the purpose of obtaining more and better information in regard to the special duties devolving upon them. We may refer to the master mechanics' and car-builders' associations as notable instances. Their proceedings are characterized by an endless succession of questions and answers—the former being of course the most numerous. Many of these queries could be satisfied were there a uniform system of returns applicable to rolling-stock, so that the particulars could be readily classified and tabulated. We need not multiply reasons for such a reform. Its necessity is patent to all; and although there are obstacles to its immediate realization, they are by no means insurmountable.

Narrow Gauge.

The gauge controversy has of late been very quiet; not that the weaker party has abandoned the field to its more powerful adversaries, for its advocates appear to be pushing forward its enterprises with steady perseverance, in spite of the general collapse of other railway projects. According to a pamphlet recently issued by Mr. Howard Fleming, a notice of which will be found in another column, the total length of completed narrow-gauge railroads in the United States and Canada is 2025 miles, of which 886¾ miles were built in 1874, being an increase of 377 miles over the narrow-gauge construction of the previous year. Assuming these figures to be correct, it would seem that very nearly one half of the new railway mileage of 1874 is narrow-gauge, the entire amount of new construction of all kinds for that year being estimated at 1923 miles.

The projected narrow-gauge mileage is stated at 6302, and it is also believed by Mr. Fleming that a large additional mileage will be constructed during the current year.

This indicates that there is some vitality existing among the advocates of the new system, and that they are bent upon showing their faith by their works rather than by abstract theorizing.

It is to be noted that the completed lines are all of them very short and of merely local importance, many being less than 12 miles, and the others averaging about 25. The longest projected lines are still in progress. The completed portions of the principal ones are as follows: New-Brunswick, 100 miles; Cairo and St. Louis, 118; Prince Edward Island, 120; Denver and Rio Grande, 172, and Toronto, Grey and Bruce, 195 miles. The traffic of the unfinished lines, however favorable the results thus far may be, is not considered a fair criterion of what it will ultimately be when the lines are completed and their business fully developed. The embarrassments that have overtaken so many of the standard-gauge roads will doubtless have the effect of attracting more attention than heretofore to the alleged advantages of the three-foot gauge on the score of economy in construction and operation.

The comparative merits of the two systems, however, can never be satisfactorily determined until the problem has been worked out in practice, as it has been in England between the old-fashioned wide gauges and the present standard of 4 ft. 8½ in. The latter won; but it does not follow from this that a 3-foot gauge is still better. There is a boundary somewhere between the two systems which may prove very difficult to define. Their respective advantages are so interwoven, that we can only perceive them clearly when we pass to one side or the other of the neutral line. The case involves too many complications to be settled theoretically, especially when there is a pre-existing bias in the minds of the parties to the controversy. The progress of narrow-gauge construction bids fair at no distant day to demonstrate the actual merits of the system and determine the limits of its usefulness. It will then in all probability be discovered that narrow-gauge is not a specific for all the ills that railroad economy is heir to, but that it has nevertheless a distinct sphere of its own, which it can occupy to advantage and without detriment to the wider gauge which already has possession of the field.

It is admitted, we think, by the most experienced railroad men, that for peculiar localities and certain kinds of traffic a three-foot gauge is more economical than a wider one, and can be made instrumental in providing access to markets that otherwise would be inaccessible except at a much greater cost, and at the same time contribute, as feeders, to the business of larger and longer lines. But that it will ever displace to any considerable extent the existing standard gauge, is extremely improbable. The necessity of greater uniformity is becoming greater year by year. Any break of gauge in extended connecting lines involves mercantile isolation more or less; and it is only when from the rugged nature of the country, or some other local peculiarity, the choice lies between entire isolation or access to markets at a moderate expenditure, the advantages of narrow-gauge railways are likely to be appreciated.

The Dickson Manufacturing Company, to whom belonged the Cliff Locomotive Works, at Scranton, recently destroyed by fire, have resolved to rebuild the works at once. It is intended that a portion of the shops shall be fully equipped and ready for operations by the 1st of July next.

Central Railroad of New-Jersey.

THE report of the directors of this road for 1874 shows its business to be in a prosperous condition, with the prospect of steady growth in the future. There has been a moderate falling off in general traffic as compared with the previous year. This, however, has been offset to a considerable extent by a reduction in expenses. The passenger business has more than held its own, which is no doubt due, in a great measure, to the excellent management in providing for the accommodation of local and through travel. The trains, as regards frequency, precision of time, and every essential requisite, are admirably adapted to the requirements of the large and increasing local traffic between this city and contiguous points along the line. The company has done much to augment this traffic by the erection of attractive and commodious station-houses, with surroundings of trees, shrubbery, and flowers, instead of a waste of barrenness and rubbish. These, with the favorable character of the country, are a stimulus to owners and new-comers to make corresponding improvements, and contribute to the rapid growth of the many places along the road. The condition of roadway and equipment evinces an unremitting attention to details, the result of thorough organization, and capable supervision in all branches of the service.

Within the past five years the main line has been increased from 75 to 180 miles, with numerous branches reaching from the seaboard to the finest centres of anthracite coal. The company has, in the mean time, become the owners of a large interest in coal lands, sufficient to furnish the road with transportation, independent of other sources, for an indefinite time to come. The gross earnings have also increased within the five years above named, from $4,010,121 to $8,589,631, and the net earnings from $1,367,958 to $4,449,029. The substitution of steel rails for iron, and the keeping of roadway and rolling-stock in first-class condition, have had the effect of materially reducing current expenses. Forty-eight miles of steel rails were laid during 1874, making 239½ miles in all. For the current year 7000 tons have been ordered in addition to 274 tons due on previous contracts. The rails already laid continue to give perfect satisfaction. The present rolling-stock equipment consists of 242 engines, 182 passenger-train cars, 1784 8-wheeled freight-cars, 14,621 4-wheeled cars (mostly coal), and 242 miscellaneous.

Winter on the Rail.

THE prolonged and intense cold of the past winter has tested the quality and endurance of track material more severely than for many years previous, and the results are manifest in a largely increased number of accidents. The monthly record published by the *Railroad Gazette* shows 75 derailments from broken rails during the months of January and February, the number reported for the latter month being more than twice that of the former. This indicates pretty clearly that frost and extreme low temperature tell upon rails and fastenings; but for want of precise information in regard to the kind and quality of material fractured in each particular case, no very definite general conclusions can be arrived at. If these particulars could be ascertained, we have no doubt they would show the very great superiority of steel to iron rails in resisting the influence of frost; and it would also appear that neglected repairs of road-bed and renewals of iron rail have been directly the cause of many accidents which have contributed to swell the recent catalogue.

We have in another column alluded to the want of more full and reliable railroad statistics. These are glaringly defective with reference to accidents of every class, of which there is no official record made in a form for tabulation, and embracing all essential particulars. Were such a record kept by every road, and published in connection with their annual reports, a general exhibit could be made in regard to the comparative economy and safety of material, devices, and methods, of great value to railroad interests, and calculated to steadily lessen the number of accidents arising from defects which are now but imperfectly known, because not clearly and definitely ascertained and classified.

A New Economy.

A CORRESPONDENT of *The Railway World* suggests a new plan for reducing the weight of freight-cars, by dispensing altogether with sides, ends, and top, and covering the freight with tarpaulin. With this arrangement he thinks all goods could be carried safely except gunpowder and the like, while a great saving would be accomplished in the cost of cars, to say nothing of the lightening of trains and smaller consumption of fuel. Such a plan may look very well on paper, but we very much doubt its feasibility in practice. It would supersede the necessity of patent freight-car locks and bring their inventors to grief; but the gain in this respect would be more than offset, we imagine, by increased depredations upon valuable property in transit with nothing more substantial than a tarpaulin covering to protect it. Another difficulty also suggests itself. How could the ten tons, more or less, of miscellaneous merchandise be kept in horizontal and vertical trim as it goes thumping and pounding along the track, to say nothing of the shocks and jerks of stopping and starting? It seems to us that under such a system a good many deliveries of way freight would occur at points not specified in the bills of lading, and that some of the through freight would be appropriated by tramps before reaching its destination. The writer mentions as another advantage incident to his plan, that "the whole train could be seen from the engine," a statement which we think must be subject to some modification in the case of very long trains running through the woods on very dark nights. We hope, however, the plan will be tried. It may prove a success. If it does, the dead-weight problem will be very much simplified, and railway freight traffic relieved of a heavy burden of expense.

IT is not our province to indulge in panegyric, but we can not refrain from offering our humble tribute to the exalted statesmanship of the recently defunct Congress, as exemplified in the restoration of the odious franking abuse, and doubling the rates of postage on transient printed matter sent through the mails. Under these twin masterpieces of enlightened legislation, it costs four cents to send a transient copy of the CAR-BUILDER by mail from New-York to Jersey City, and only two cents from New-York to Liverpool; while stacks of electioneering literature and Patent-Office Reports can travel in the mails all over the country, free gratis. This is surely an age of progress! If so, why not? Can any man say otherwise? Which?

THE Car-Builders' Committee on Brakes held a meeting at the rooms of the Association in this city, on the 18th ult., and adjourned to meet at the St. Clair Hotel, in Baltimore, on the 13th of April, at 10 o'clock A.M. The committee consists of R. S. Ramsey, George Hackett, and G. W. Demarest.

PEOPLE who order specimen copies of the CAR-BUILDER without intending to subscribe for the same, will please send four cents in postage-stamps, so that the new law will not get too much the advantage of us. We are disposed to be liberal, except in extreme cases.

THE Pullman Palace-Car Company are making nine palace-cars to fill an order from Italy, and eleven to satisfy an English order, before similar orders from Canadian railways and Turkish and Russian firms have been completed.

Car-Builders' Monthly Meeting.

THE regular monthly meeting for social and business purposes was held at the rooms of the Association on Thursday evening, March 18th. The attendance was fully up to the average of previous meetings, and included many car-builders and others connected with railways; also a number of scientific men and manufacturers of railway material.

The special business of the evening was the examination and testing of a large number of models showing the various methods of framing the sides of freight-cars. These had been sent to the rooms, in compliance with a request made at the January meeting, and numbered about thirty, all constructed of yellow pine, on a scale of 1½ inches to the foot, and representing an entire car-side. These were successively subjected to a vertical strain sufficient to deflect the plates not in any case exceeding an inch, the extent of the strain being determined by platform scales.

The results, so far as the experiments were made, were not altogether satisfactory, owing to the faulty construction of many of the models, and also to the imperfect arrangements for making the tests. The strain was concentrated too much in the centre or doorway of the sills, and the bolts and washers attached to the tie-rods were often forced into the wood for the want of sufficient surface and strength to the washers, causing the structure to yield before its maximum strength was reached. In many of the models the girt was wanting, but those which had it showed increased endurance. The plates, in several cases, were weak under compression, showing the need of greater sectional area. The braces were also, in some instances, forced into the plate, where the bearing against it was reduced in consequence of the braces being beveled against the posts, thus leaving but a small surface to resist vertical pressure, and showing that the entire end should have a bearing on the plate. The power of resistance should also be increased still more by providing cast-iron seats for the ends of the braces, which would still more distribute the pressure.

A discussion took place upon the general subject, but which we can not undertake to report, as it would be unintelligible to a great extent without the aid of drawings.

The subject will be resumed at the next meeting, which will be held on Thursday, April 15th.

An Encyclopedia of Car-Couplers.

WE would suggest to some of our enterprising compilers and publishers that there is room in the field of railway literature for a new and profitable venture. We already have a variety of extremely useful hand-books, manuals, and treatises upon special topics; and in due time we trust the catalogue will be increased by the addition of a Dictionary of Terms. We are not aware, however, that there is any work extant which gives a full and reliable history of *Car-Couplers*, beginning with their origin and tracing the progress in this line of invention, as shown by the records of the Patent Office, down to the present decade, or any earlier period. The materials for a bulky volume of illustration and description are not only abundant and accessible, but increasing day by day with an accelerated progress, which shows the extreme fertility of this field of inventive activity.

Such a volume, if carefully compiled, so as to embrace every device up to the moment of publication, would doubtless meet with a ready sale, and would also prove a valuable guide to future inventors in this line, by affording a view of the whole ground previously gone over, and the rights already under pre-emption. We will not undertake to decide upon the name to be given to such a work, but it seems to us it might very appropriately be called an "Encyclopedia of Car-Couplers."

Economy in Car Ornamentation.

To the Editor of the National Car-Builder:

DEAR SIR: The appropriate and timely remarks in your last issue in reference to graining, or the imitation of cabinet woods in the inside finishing of cars, induce me to offer for the consideration of your readers some suggestions of my own on the subject, derived from an experience of many years in this particular branch of car construction. As regards this style of finish, there is doubtless some difference of opinion, as there is upon all other matters of a like nature; but it is specially worthy of attention just now in its economical bearings. It was practiced fifteen or twenty years ago much more than it is now, but gradually gave place to fine woods and veneers; and although still employed to a considerable extent for cheap work, it is far from being popular. As a matter of economy, however, and in cases where it would not materially detract from the general appearance, it certainly merits greater attention than it is now receiving.

Of late years, extremes have been the rule, and although railroad companies have vied with each other in their efforts to promote the comfort and convenience of travelers, it is questionable whether they have been repaid for the additional expenditure involved. It may be doubted whether the public at large fully appreciate the luxurious fitting up of the better class of passenger-coaches in the matter of fine cabinet-work, and especially the great expense attending it. A good imitation would in no wise diminish the comforts of traveling, while the great majority would not perceive the difference unless their attention was particularly drawn to it. If the general effect is pleasing, harmonious, and free from incongruity, very few would be disposed to give it a close inspection, or criticise the intrinsic quality of the work. It is a very common remark with regard to graining, that it looks better than the actual wood of which it is an imitation, especially if it is skillfully and artistically done. There is a recognition and appreciation of the labor and skill of the artisan, instead of the mere lavish expenditure involved in the use of natural woods.

In saying this much in behalf of an inferior and less expensive style of car-finishing, I would not be understood as recommending its adoption for all classes of cars; and still less with a view of injuring any class of mechanics or employees of railway corporations. It is only as it relates to the present exigency, in which economy is the prime consideration in every branch of railway operation, and in which the great mass of employees are as directly interested as the roads themselves.

In graining, it is not essential that the different woods should be imitated with literal accuracy. No two pieces of the natural woods are alike. The difficulty in graining is not so great as many suppose. We have only to get the ground and graining colors of the proper shade for each kind of wood. The skill acquired by practice is of course indispensable; but quite as much depends upon the right shade of color for a foundation as in executing the graining, and no practical workman expects to imitate walnut or mahogany on a ground prepared for ash or oak. I have had some experience in the use of a process of graining by means of plates, introduced within the past few years, but do not consider it a suitable method for car-shops. As the process is mechanical, so is the effect; there is a monotony and stiffness about it which are not apparent in good honest hand-work, for the reason that the latter displays more of the variety which any one may notice in the grain of natural woods, no two panels in a car being the same. It is the variations presented by different surfaces of the same kind of wood that please the eye, and which can be best imitated by the dexterity of the hand.

Many who are not familiar with this beautiful art are under the impression that it is merely a cheap way of doing work, especially on cars. This is true only to a certain extent—that is, as compared with the greater cost of fancy woods and cabinet-work; cheapness is not its only merit, and I can not but think if those who disparage the art, and especially railroad officials who are averse to using it upon cars, would confer more freely with practical car-painters, and give more weight to their suggestions, a great deal of useless outlay might be avoided in the item of rolling-stock expenditure. In saying this, the writer is not unmindful that the principle of imitation in car decoration is not a popular one; and in the submitting the above views, he may incur the risk of lowering himself in the estimation of his associates of the craft. A little careful reflection, however, and a tolerant allowance for adverse opinions, will enable all of us to see the matter in its true light. What I have said, I have said in the interest of practical economy, which, in consequence of not sufficiently investigating minor details, is not carried out in many particulars because the saving is not as apparent as it is in a reduction of working force or a curtailment of wages.

I am persuaded that the adoption of a less expensive style of finishing for a large class of passenger-cars will prove an excellent venture on the side of economy, and that the roads that may have the courage to inaugurate it will suffer no detriment at the hands of the public. CAR-PAINTER.

Car-Shop Notes.

A CORRESPONDENT writing from Wheeling, W. Va., says: "The car-shops at this point are not on an extensive scale, but are sufficient for the wants of this division of the Baltimore and Ohio road, embracing about 130 miles, and including the old Hempfield line running from here to Washington, Pa. When this latter road is extended, as it doubtless will be, so as to connect with the Pittsburg, Washington and Baltimore, the distance from here to the latter city will be shortened about forty miles. The Baltimore and Ohio Company, some time ago, commenced the erection of extensive shops at Wheeling, but only the car-shop was completed. It is a comfortable and convenient brick building with track room for ten cars. The principal work done is repairing. Mr. C. Ditman is the foreman of the car department, and Mr. E. L. Weisgarber is the master-mechanic, both experienced men in their respective positions. The only novelty in the way of machinery is a centrifugal circular saw, which is very effective in its operation, but can not be described without the aid of drawings.

"The Loughridge brake is used on all passenger-trains, and does good service. The power used is compressed air, and the pump is worked by the locomotive. This method of working the pump may seem objectionable as compared with the Westinghouse plan, but in practice there is always a pressure of at least 80 lbs. in the reservoir when the engines come in from their trips. The application of the power on the levers from the air-cylinders is more direct than by any other plan, and the apparatus is considered in bad order when there is a leakage of 10 lbs. inside of 24 hours.

"At the shops of the Pan Handle division, at Steubenville, the average force employed is 180 men. During the past year a large number of freight and passenger cars have been repaired and some new work turned out. The expenses of the car department of this division for 1874 foot up $125,000 less than for the previous year. Fewer cars have been disabled, the road has been managed with greater care, and the result has been a diminished expenditure and greater immunity from accident."

MISSOURI, KANSAS AND TEXAS

The car-shops of this road are located at Sedalia, Mo., at the intersection of the line with the Missouri Pacific. They are temporary frame structures adapted to the building of freight and passenger cars. The car equipment of the road consists at present of 67 passenger-train cars, including five Pullman coaches and one directors' car, and 1198 freight-cars of all classes. To keep up repairs, about 100 men are employed in the car department, which includes all points along the line where car work is done. The expenses within the last half-year have been considerably reduced. The road being comparatively a new one, the cars now in use were built mostly at contract shops. The passenger equipment is from the Ohio Falls Car Works, and appears to be in good condition. The most notable among these is the "Prairie Queen," designed for the use of the road officials. At each end of the car is a sort of rotunda or vestibule, the intermediate space being occupied by a parlor, sleeping and dining rooms, lavatory, and a very completely equipped pantry and kitchen. The exterior of the coach is embellished on each side with three oval panels, one containing the name of the car, and the others representations of scenery along the line of the road. It runs upon 6-wheeled trucks, and is the only car on the road with 7-inch journals, the others having 6-inch. The "standard" axle does not seem to be very popular on the Western roads; not as much so, at all events, as on the Eastern ones. New roads just starting do not favor it, and the reason seems to be on account of the excessive weight; 3½ x 7 journals are preferred, and it is believed by many that the "standard" will ultimately be modified to conform to these dimensions.

We noticed that the heavy side-link draw-bars are in use on this line, with an additional dead-weight, sill crushing attachment, or, in other words, a shoulder that strikes the end-sill before the buffer-spring is exhausted. The weight of this ponderous affair is 226 lbs. It has nevertheless one redeeming quality, as it does not necessitate going between the cars when two of the same kind are to be coupled. The side-links can be put in place after the cars are in contact. The standard brass in use is a saddle-top, weighing 10 lbs., very heavy but serviceable, and the metal so distributed as to insure a large percentage of wear.

A large portion of the road running through a prairie region, the pocket and chute method for coaling engines is used, which is too well known to need description. Mr. J. Townsend is the superintendent of the car department.

New Publications.

Narrow-Gauge Railways in America. Embracing a Sketch of the Rise, Progress, and Success of the New System. By Howard Fleming.

This is a pamphlet of 79 pages, and contains in concise form much valuable statistical and other information relative to narrow-gauge railroads in this country. It does not pretend to give any portion of the voluminous literature growing out of the controversy on the gauge question as it was carried on originally in England between the advocates of the 6 and 7 foot gauges on the one hand, and the 4 ft. 8½ in. on the other, nor as it has recently been carried on in this country between the three-foot and so-called standard gauge. The author is evidently an enthusiastic advocate of the former, and presents with clearness and brevity the leading arguments in its favor. Whatever may be the force of the arguments on the other side, the progress in the construction of narrow-gauge roads in this country within the last three years is an evidence of a growing popular belief in their practical utility. This progress is shown in a list of such roads, with their projected and completed mileage, and exhibiting the new construction from year to year since the ground was broken for the initial line—the Denver and Rio Grande—in 1871. The pamphlet also contains illustrations of narrow-gauge cars and locomotives, with detailed statements of dimensions, capacity, etc. There is also a very complete directory of American narrow-gauge roads, with the dates of their organization, the amount of capital

stock, equipment, maximum grade, curvature, weight of rail, and names and address of officers.

This we believe is the first publication of the kind that has been issued. As such, it will prove a valuable record and a convenient manual of reference for all who are interested in the growth of the new system. Copies may be had by addressing the author, 216 South Fourth street, Philadelphia. Price, 50 cents, postage prepaid.

The Traveler's Official Guide, for March, more than sustains its high character for reliability and excellence. It contains a new railway map of the United States and Canada, somewhat smaller than the one in previous numbers, but remarkably full, clear, and distinct in its details. The other maps scattered through the volume are very numerous and exceptionally well executed, showing the location and connections of the leading lines of road, together with the geographical details of the contiguous territory. In addition to the time schedules, distances, connections, offices, etc., of the various roads, there is full and carefully revised information in regard to ocean and inland routes of steam navigation, and a copious index to railway-stations. Published by the National Railway Publication Company, 233 South Fifth street, Philadelphia. Price, $4 per annum.

The Penn Monthly for April contains a number of articles of sterling excellence adapted to the tastes of intelligent, thoughtful, and cultivated readers. In the range of topics discussed, this magazine occupies a field peculiarly its own, and is worthy of a wide appreciation. The current number treats of National Education; The Relative Morals of City and Country; The Glacial Epoch; The Election of Police Magistrates, and other topics of general interest. The publication is now in the sixth year of its existence, and has become a recognized authority upon social, scientific, and political questions. Published by the Penn Monthly Association, 506 Walnut street, Philadelphia. Price $3 a year, postage paid.

The Progressive World is the title of a new monthly journal, published at St. Louis, and devoted to railway, mining, and manufacturing interests. The initial number contains twenty-four pages of original and selected matter, is well printed, and gives evidence of ability, experience, and discrimination in its adaptation to the wants of the industrial interests of the Mississippi Valley. It is conducted by R. O. Thompson, who has been heretofore connected with St. Louis *Railway Register*. Price of subscription, $2.

We have received a copy of a memorial addressed to the Legislature of Wisconsin by the Chicago and Northwestern, and Chicago, Milwaukee, and St. Paul Railroad Companies, in which the principles and practical results of railway operation are so fully and clearly set forth by an array of facts and comparative exhibits, that the members of the aforesaid body can not fail of being instructed thereby. The case is made so plain, that the wayfaring man, though a Granger, need not err in comprehending it.

Miscellaneous Items.

The Painesville and Bridgeport intends to build a narrow-gauge road about seventy miles long from Youngstown south to Bridgeport on the Ohio, opposite Wheeling. It will be an extension of the Painesville and Youngstown.

The Detroit Car Works at Detroit, Mich., have been at work with 250 hands all winter. They recently shipped two passenger-coaches and 50 flat-cars to the Virginia & Truckee road, and are now at work on an order for the Michigan Central.

The Ranlet Manufacturing Company, Laconia, N. H., have constructed a freight-car which can safely carry two tons of freight to one of dead weight, the reverse of which is true of ordinary freight-cars. The body of the car is supported upon one truck of six wheels.

One engine, one passenger, and six freight cars have arrived at Houston, Texas, for the Texas Western (narrow-gauge) Railroad. The engine weighs 15 tons, has six connected drivers and pony truck, and was built by Dawson & Bailey. The cars are from the Ohio Falls Car-Works.

At a large meeting of persons interested in having direct railroad communication between Woodstown and Philadelphia, held in the last week of February, at Harrisonville, New-Jersey, resolutions were almost unanimously adopted favoring a narrow-gauge road, and books were opened for subscriptions. Meetings are being held at other points on the line of the proposed road, and the prospect of carrying the enterprise through to a successful termination is very favorable.

A Virginia inventor has procured a patent for an "indicator" of stations, streets, etc., for use on railroads. It is said to be very simple in construction, and easily worked. It consists of a box containing two rollers, with a cog-wheel which works both, and a lever and bracket so attached to the cog-wheel that when the lever is pulled it rolls a strip of canvas, which tells the name of each station next to come, how long the train stops for meals, and where passengers should change cars for various points. It is so arranged that the simple turning of a key reverses the operation of the rollers and canvas; and it indicates the stations at night by having a light in the back part of it.

Three years' experience on the Denver and Rio Grande road has determined the fact that much wider cars can be run with safety than was at first supposed possible. They are now building passenger and freight cars 8 feet wide. The Superintendent, Mr. W. W. Borst, says that, were he to begin anew, he would make all the passenger-cars 8 feet 3 inches wide, outside measurement, giving room, with a narrow aisle, for good double seats on each side, as in wide-gauge cars. By placing the sills of the narrow-gauge car so much nearer the rail, an angle of safety is secured amply sufficient to prevent overturning, even at high speed; this also greatly diminishes the oscillation of the car, an important point for the comfort of passengers. A Denver editor gives it as his experience that he can write on a narrow-gauge with less difficulty than on any wide-gauge car, not even excepting the Pullman palace.

A correspondent of an English exchange thus speaks of an utilization of sawdust:

"It will probably be of some interest to your readers to learn that some exquisite specimens of work, vieing with the finest carvings, have been turned out by the cabinet-makers of the Faubourg St. Antoine, Paris. It appears that by the simultaneous application of great pressure and heat, these ingenious workmen have succeeded in causing the particles of sawdust to agglutinate, so that if compressed in a mould, the result is a solid mass, of any desired shape, presenting a brilliant surface, and endowed with a durability and beauty of appearance not found in ebony, rosewood, or mahogany. This product is known as *bois dure*. Another very peculiar body, which approximates more to boxwood in appearance, is formed by the admixture of glue, phosphate of lime, alum and sawdust, a kind of dough being formed with boiling water, which admits of being pressed into moulds. This compound also takes a very high polish. An application of somewhat similar nature has been made in Canada, by J. Kent Griffin, who took out a patent for making a composition for pavements, blocks for buildings, etc., from sawdust or disintegrated wood, mixed with silicate of soda and asphalt, and then heated."

Empire Portable Forge Company.—We call attention to the advertisement of this company, containing the report of the Chief Engineer of the U. S. Navy upon the merits of the portable forge manufactured by them at their works at Troy, N. Y.

Facetiæ.

"Too thin" has become obsolete. "Not sufficiently materialized" is the latest form in which this idea is clothed.

"What station do you call this?" said a man, as he crawled out of the débris of a railroad smash-up. "Devastation," replied the conductor.

The net earnings of a Florida railroad last year were nineteen cents. No dividend will be declared, and the amount will be added to the sinking-fund.

A hottentot once got up a painting of heaven. It was inclosed with a fence made of sausages, while the centre was occupied with a fountain that squirted pot-pie.

A California preacher is preaching on the best way to raise boys. We have always found a Number 14 boot about as effective as any thing for raising them.

A malicious politician says the Grangers turn out to dig the graves of deceased brothers, thus preventing extortion on the part of that "middle-man," the sexton.

"How came such a greasy mess in the oven?" said a lady to her maid-of-all-work. "Why," replied the girl, "the candles fell into the wash-tub, and I put them in the oven to dry."

A Cleveland youth of rather fast proclivities fell in love with a parson's daughter, and as a clincher to his claims, said to the reverend gentleman, "I go my bottom dollar on piousness."

Sooner or later, justice certainly overtakes the leader of a country brass band. A bridge came along and struck one on the head, the other day, as he stood on the top of an Erie freight-train.

When an Arkansas judge ascends the bench, the first thing he does is to feel under the desk for the whisky-bottle, and if the tipstaff has forgotten to have it filled, legal proceedings that day don't amount to much.

Two Irishmen traveling on the Baltimore and Ohio Railroad track came to a mile-post, when one of them exclaimed, "Tread aisy, Pat; here lies a man who was 108 years old. His name was Miles—from Baltimore."

A short time since a noble savage came to a certain agent in the northern part of Iowa to procure some whisky for a younger warrior who had been bitten by a rattlesnake. "Four quarts?" repeated the agent, with surprise; "as much as that?" "Yes," replied the Indian; "four quarts—snake very big."

A woman committed suicide by hanging herself to an apple-tree. At the funeral, a neighbor, noticing the sad appearance of the husband, consoled him by saying he had met with a terrible loss. "Yes," said the husband, heaving a sigh, "she must have kicked like thunder to shake off six bushels of green apples that would have been worth a dollar a bushel when they got ripe."

Browsy Bunker, of Carmel, loafed around all day trying to get the highest bid for his vote. He wanted three dollars; but just as they were about to compromise on two dollars and a half, the sun went down and the inspector declared the polls closed. All he remarked was, "Great Cæsar! is it possible I'm not in time to vote for the constitutional amendment prohibiting bribery at elections?"

The "Eclipse" Fan-Blower,



For Blacksmiths, Coach-Makers, Machinists, Contractors, and all having use for Smith or Forge fires. Suited to any fire, right or left side; works easy, blast regular, and made at will for light or heavy work; only occupies 12×20 inches floor space; cheaper and better than bellows.

ALSO

TIRE BENDERS and TIRE IRONS.

Circular and Price free. Address

EZRA F. LANDIS,

LANCASTER, PA.

Or T. H. KING & CO., San Francisco, Cal.

EMPIRE PORTABLE FORGES

NO BELTS, BELLOWS OR CRANKS,

THE BEST MADE.

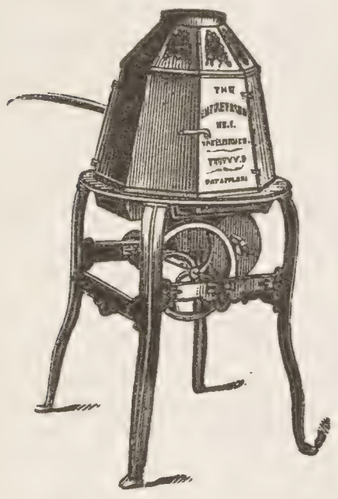
Send for Catalogue to the

Empire Portable Forge Co. Troy, N.Y.

UNITED STATES NAVY YARD,
CHIEF ENGINEER'S OFFICE, BUREAU OF STEAM ENGINEERING,
WASHINGTON, D. C., November, 1874.

COMMODORE THOMAS H. PATTERSON, U. S. N., COMMANDANT:

SIR: In obedience to your order of October 5th, 1874, to carefully test the "EMPIRE PORTABLE FORGE," (No. 1, with hood), I have the honor to submit the following report:



The blast is supplied by a small fan-blower, operated with a hand-lever connected to a toothed wheel geared into a pinion. Upon this pinion shaft is a friction-wheel operating against a friction pinion upon the axle of the blower. The shaft of the friction-wheel revolves in sliding supports, to allow for the vibration of the shaft, with a spring acting against each support to keep the friction-wheel against the pinion.

The blast is strong, and sufficient to keep up any required amount of heat. The fire-pan is covered with a hood of cast-iron, with doors for passing the rivets.

This is a very excellent and convenient forge. It works easily and with but little noise, and the power being applied with a lever, it can be worked without interfering with the manipulations of the fire.

I can recommend it as a very useful tool for work on ship-board or shop use. Very respectfully, your obedient servant,

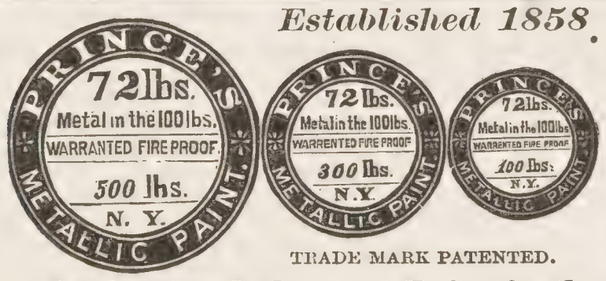
[Signed] EDWIN FITHIAN,
Chief Engineer, U. S. N.

Read Advertisement of

BRIDGES' LUBRICATOR,

Page x.

Established 1858.



TRADE MARK PATENTED.

The best and cheapest Paint in the world for Iron, Tin or Wood. For sale by the Trade everywhere. PRINCE'S METALLIC PAINT CO., Manufacturers, 96 Cedar St., New York.

CAUTION.—Purchasers and consumers are cautioned against imitations of our METALLIC PAINT. All genuine *PRINCE'S METALLIC PAINT* will bear our name and trade mark on each and every package. Send for a circular.

Excelsior, Steam-Refined, Cylinder, Engine, Spindle, Wool, Carbon, and High-Test

BURNING OILS.

Also, No. 1 Sewing-Machine Oil.

The best and cheapest in the market. Send for circular and price-list.

GRIM BROTHERS,

Dealers and Manufacturers,

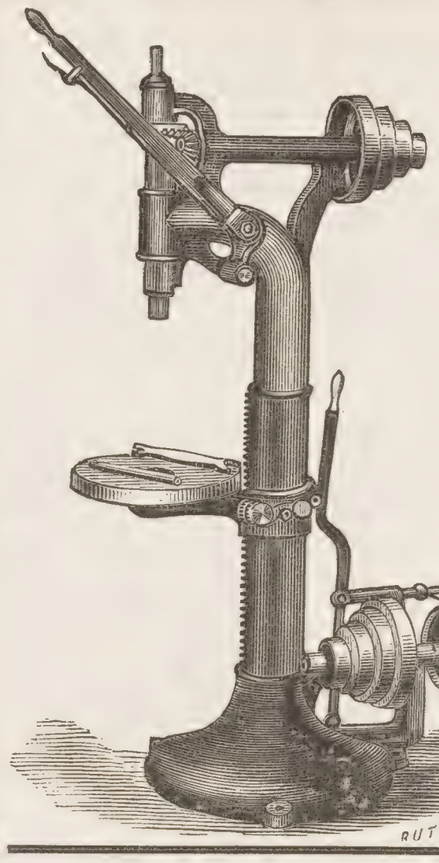
Agents Wanted) 236 Penn Ave., Pittsburgh, Pa.

SOLID HEAD

NICKEL-PLATED SCREWS.

ADAMS NICKEL-PLATING and MFG. CO.

South Windham, Ct.

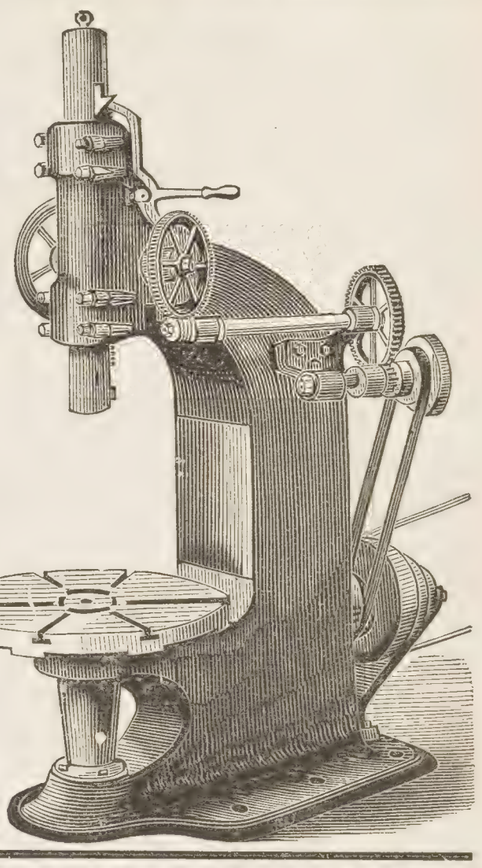


EDWIN HARRINGTON & SON,

Manufacturer of **ENGINE LATHES,** from twelve (12) to forty-eight (48) inches swing; **Hand Lathes; Wood Turning Lathes; Vertical Drills; Boring Mills; Tapping and Centring Machines; Screw Press** for Mandrels; **Grindstone Boxes.**

Cor. North-Fifteenth St. and Pennsylvania Ave.

PHILADELPHIA.



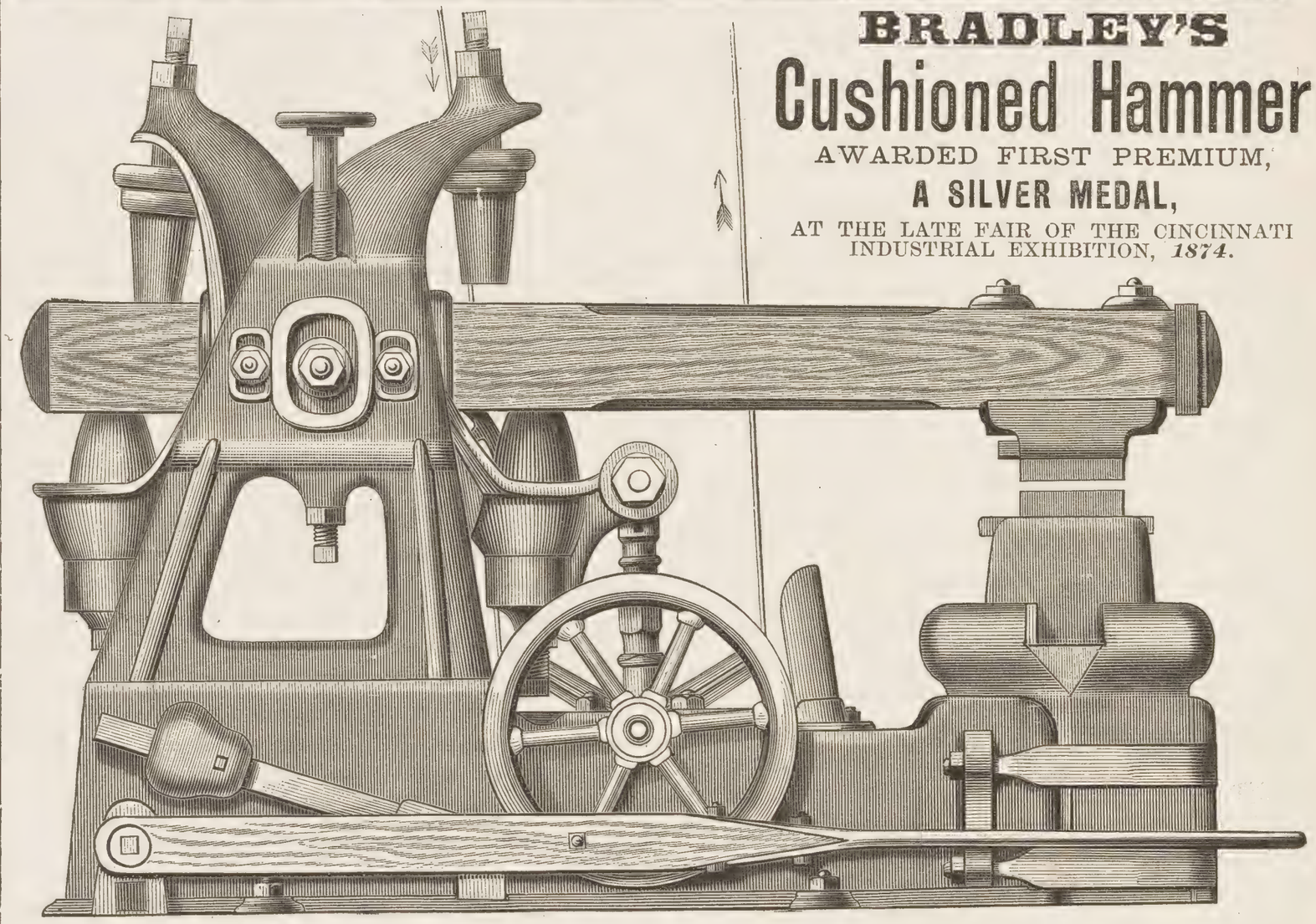
BRADLEY'S

Cushioned Hammer

AWARDED FIRST PREMIUM,

A SILVER MEDAL,

AT THE LATE FAIR OF THE CINCINNATI INDUSTRIAL EXHIBITION, *1874.*



This Hammer has many valuable improvements made useful in the device for cushioning the blow, thereby relieving all the working parts from that jar and concussion which is the destroying element of other helve hammers. It is made

Adjustable in Line of Action, Length of Stroke Rapidity of Motion, and Weight of Blow,

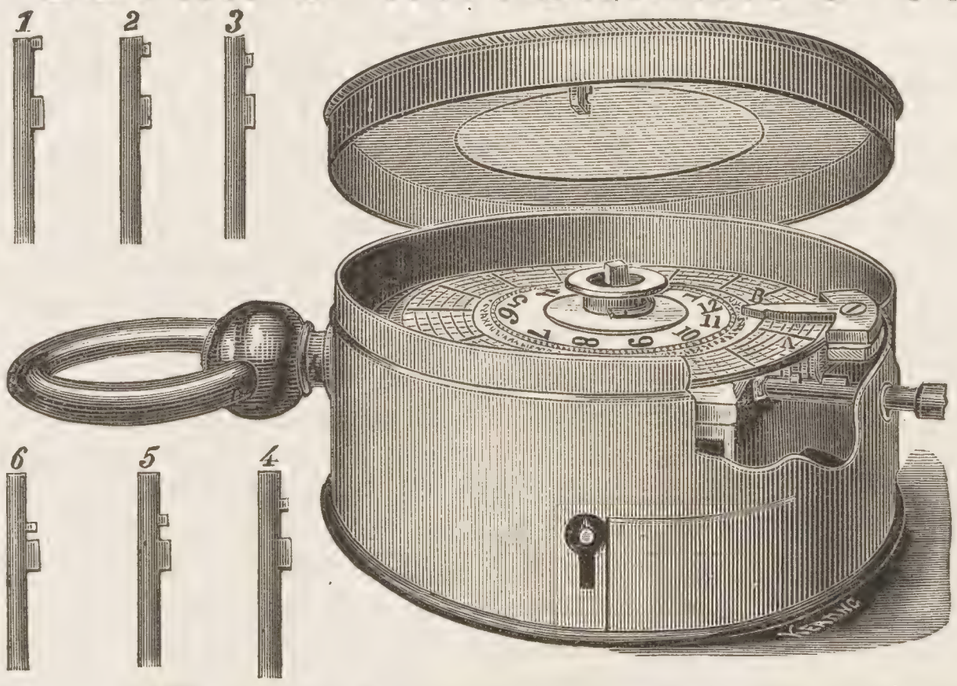
all of which are controlled at the will of the operator. They have

Larger capacity, cost less, are more durable, take up less room, do more and better work at less expense for power than any other Hammer in use.

We guarantee them fully as recommended. For particulars, address

BRADLEY MANUFACTURING CO., Syracuse, N. Y.

BUERK'S WATCHMAN'S TIME DETECTOR.



Important for all large corporations and manufacturing concerns; capable of controlling, with the utmost accuracy, the motions of a watchman, as the same reaches different stations of his beat. Send for Circular.

J. E. BUERK,

P. O. BOX 979,

84 Washington St., Boston, Mass.

N. B.—In the suit against *Imhaeuser & Co.*, a decree was given, June 10th, 1874, granting an injunction against them, and awarding an account of damages for infringing on the Patent of Buerk's Watchclock. The public is hereby cautioned not to purchase Watchman's Time Detectors infringing on Buerk's Patents.

☞ *In sending for Circular or ordering the above, please mention this paper.* ☜

Car Manufacturers.

Allison, W. C. & Sons.....Philadelphia Pa.
Anderson, J. R. & Co.....Richmond, Va.
Allegheny Car & Transportation Co.....Swissvale, Pa.
Altoona Manufacturing Co .. ..Altoona, Pa.
Adrian Car Co .....Adrian, Mich.
Arlington Car Manufacturing Co.....Arlington, Vt.
Barney & Smith Manufacturing Co.....Dayton, Ohio.
Baker, Jackson & Co.....Latrobe, Pa.
Bellefonte Car Manufacturing Co. .....Bellefonte, Pa.
Billmeyer & Smalls.....York, Pa.
Bradley, Osgood.....Worcester, Mass.
Bridgeport Car-Works.....Bridgeport, Pa.
Brill, J. G. & Co.....Philadelphia, Pa.
Buffalo Car Co.....Buffalo, N. Y.
Canada Car Co.....Toronto, Canada.
Canda, F. E. & Co.....Chicago, Ill.
Cape Fear Building Co.....Abbottsburg, N. C.
Cartersville Car Co .....Cartersville, Ga.
Central Car & Manufacturing Co.....Jackson, Mich.
Clendenning, W. W.....Montreal.
Cummings Car-Works.....Jersey City, N. J.
Connellsville Machine and Car Co.....Connellsville, Pa.
Corunna Car Co.....Corunna, Mich.
De Pere Iron-Works.....De Pere, Wis.
Detroit Car-Works.....Detroit, Mich.
Detroit Car and Manufacturing Co.....Detroit, Mich.
Dawson Manufacturing Co.....Dawson, Ga.
Dickey, Neill & Co.....Toronto.
Dickson Manufacturing Co.....Scranton, Pa.
Erie Car-Works.....Erie, Pa.
Elmira Car-Works.....Elmira, N. Y.
Frederick & Co.....Catasauqua, Pa
Freas Brothers & Thornton.....Berwick, Pa.
Fremont Car Co .....Fremont, Ohio.
Gardner, F. & Co. .....Carlisle, Pa.
Gill, John L.....Columbus, Ohio.
Gilbert, Bush & Co.....Troy, N. Y.
Goold, James & Co.....Albany, N. Y.
Goodrich Car Co.....Augusta, Ga.
Hannibal Car Works.....Hannibal, Mo.
Haskell & Barker Car Co.....Michigan City, Ind.
Harrisburg Car Manufacturing Co.....Harrisburg, Pa.
Heathcote, Herbst & Co.....Glen Rock, Pa.
Hamilton, William & Son .....Toronto.
Harlan & Hollingsworth Co.....Wilmington, Del.
Herrick Car-Works.....Oswego, N. Y.
Huntingdon Car-Works.....Huntingdon, Pa.
Indiana Car Co.....Cambridge City, Ind.
Indianapolis Car Co.....Indianapolis, Ind.
Jackson & Sharp Co.....Wilmington, Del.
Jackson & Woodin Manufacturing Co....Berwick, Pa.
Jones, J. M. & Co.....West-Troy, N. Y.
Kimball Manufacturing Co.....San Francisco, Cal.
Keith, H. T. & I. N.....W. Sandwich, Mass.
Laporte Car Manufacturing Co.....Laporte, Ind.
Lombard, Thomas.....Augusta, Me.
Lebanon Manufacturing Co.....Lebanon, Pa.
Lehigh Car Manufacturing Co.....Stemton, Pa.
Litchfield Car Manufacturing Co.....Litchfield, Ill.
Mansfield Machine-Works.....Mansfield, Ohio.
Michigan Car Co.....Detroit, Mich.
McNairy, Claflen & Co.....Cleveland, Ohio.
Murray, Dougall & Co.....Milton, Pa.
McVay, Walker & Co.....Braddock's Field, Pa.
Mowry Car and Wheel Works.....Cincinnati, O.
Middletown Car & Manufacturing Co.....Middletown, Pa.
Missouri Car and Foundry Co.....St. Louis, Mo.
Myers, H. S. & Co. (small cars).....York, Pa.
National Car Co.....St. Albans, Vt.
New-Haven Car Co.....New-Haven, Ct.
Niblo, James M.....Conshohocken, Pa.
Ohio Falls Car Co.....Jeffersonville, Ind
Ontario Car Co.....London, Ont.
Oxford Co-operative Car Co.....Oxford, Pa.
Patten Car-Works.....Bath, Maine.
Peabody & Crangle Bro's.....Calais, Me.
Peters, Simon.....Quebec.
Petersburg Car Co.....Petersburg, Va.
Piqua Car and Agricultural Works.....Piqua, Ohio.
Pittsburg Car-Works.....Pittsburg, Pa.
Pittsburg and McKeesport Car Co.....McKeesport, Pa.
Pittsburg Car and Locomotive Co .....Pittsburg, Pa.
Portland Co.....Portland, Me.
Pullman Car Co.....Chicago.
Peregoy, J. H .....Houston, Texas.
Ranlet Car Manufacturing Co.....Laconia, N. H.
Russell & Co .....Massillon, Ohio.
Sands, William L.....Pottstown, Pa.
Schall, Michael.....York, Pa.
Schenectady Car-Works.....Schenectady, N. Y.
Shaaber & Johnston.....Reading, Pa.
Southern Car-Works.....Independence, La.
South-Western Car Co.....Jeffersonville, Ind.
Shoenberger & Bryant.....Duluth, Minn.
Seath & Hager.....Terre Haute, Ind.
St. Charles Manufacturing Co.....St. Charles, Mo.
Stephenson, John & Co.....New-York, N. Y.
Star Mining & Manufacturing Co.....Henderson, Ky.
Taunton Car Co.....Taunton, Mass
Tredegar Co .....Richmond, Va.
Vigo Foundry and Terre Haute Car-Works.....Terre Haute, Ind.
Watsontown Car Co.....Watsontown, Pa.
Wharton, Thomas J.....Brunswick, Ga.
Whittaker, Phillips & Co.....Toledo, Ohio.
Wason Manufacturing Co.....Springfield, Mass
Weimer, P. L. & Bros.....Lebanon, Pa.
Wyoming Valley Manufacturing Co.....Wilkesbarre, Pa.
Wells, French & Co.....Chicago, Ill.
Wilmington Car-Works.....Wilmington, Del.

Car-Wheel Manufacturers.

Albany Car-Wheel Works.....Albany, N. Y.
American Paper Car-Wheel Co.....Hudson, N. Y.
Atlantic Iron-Works.....Portsmouth, Va.
Baltimore Car-Wheel Foundry Co.....Baltimore, Md.
Barnum Richardson Manufacturing Co.....Chicago, Ill.
Barnum Richardson Co.....Lime Rock, Conn.
Barney & Smith Manufacturing Co. .....Dayton, Ohio.
Bass & Hanna..... Fort Wayne, Ind.
Blanchard & Arnold.....Milwaukee, Wis.
Boston Car-Wheel Co.....Camb'gep't, Mass.
Bowler, Mayer & Brayton.....Cleveland, Ohio.
Cayuta Wheel & Foundry Co., ...Waverly, N. Y.
Chicago Car-Wheel Co.....Chicago, Ill.
Davenport, Fairbairn & Co.....Erie, Pa.
Dawson Manufacturing Co.....Dawson, Ga.
Detroit Car-Wheel Works.....Detroit, Mich.
Ensign Manufacturing Co.....Huntingdon, W. Va.
Fulton Foundry Co.....Cleveland, Ohio.
Gill, John L. Jr.....Allegheny City, Pa.
Green's Car-Wheel Manufacturing Co.....St. Louis, Mo.
Hamtramck Car-Wheel Works.....Detroit, Mich.
Haskell & Barker Car Co .....Michigan City, Ind.
Harrisburg Car Manufacturing Co.....Harrisburg, Pa.
Heartt, Jonas S. & Co.....Troy, N. Y.
Jackson & Woodin.....Berwick, Pa.
John L. Gill.....Columbus, Ohio.
Lehigh Car-Wheel & Axle Works.....Catasauqua, Pa.
Litchfield Car M'f'g Co.....Litchfield, Ill.
Lobdell Car-Wheel Works.....Wilmington, Del.
London Car-Wheel Co.....London, Can.
Louisville Car-Wheel & Railway Supply Co.....Louisville, Ky.
Middlebrook & Mack.....Oswego, N. Y.
Missouri Car and Foundry Co.....St. Louis, Mo.
Mowry Car and Wheel Works.....Cincinnati, Ohio.
Nash, John & Co.....Cincinnati, Ohio.
Ohio Falls Car Co.....Jeffersonville, Ind.
Parker & Bailey.....St. Paul, Minn.
Pettengill, Glass & Co.....Cleveland, Ohio.
Ramapo Wheel & Foundry Co.....Ramapo, N. Y.
Russell, B. F. & Co .....Chicago, Ill.
Rutland Foundry & Machine Co.....Rutland, Vt.
Sterling Car-Wheel Foundry.....Columbus, Ohio.
Scoville, J. & N. C.....Buffalo, N. Y.
St. Louis Car-Wheel Co. .....St. Louis, Mo.
Taylor Iron Works..... High Bridge, N. J.
Thompson, Duglas..... Bordentown, N. J.
Tredegar Company.....Richmond, Va.
Toronto Car-Wheel Co.....Toronto, Can.
Washburn, Hunts & Co.....Jersey City, N. J.
Washburn Car-Wheel Manufacturing Co.....Worcester, Mass.
Wason Manufacturing Co.....Springfield, Mass.
Whitney A. & Sons.....Philadelphia, Pa.
Woodbury & Company.....E. Cambr'ge, Mass.
Wyoming Valley Manufacturing Co.....Wilkesbarre, Pa.

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Baldwin Locomotive Works .....Philadelphia, Pa.
Brooks Locomotive Works .....Dunkirk, N. Y.
Danforth & Cooke.....Paterson, N. J.
Dawson & Baily (light locomotives).....Connellsville, Pa.
Dickson Manufacturing Co.....Scranton, Pa.
Grant Locomotive Works.....Paterson, N. J.
Hinckley Locomotive Works.....Boston, Mass.
Manchester Locomotive Works.....Manchester, N. H
Mason, William.....Taunton, Mass.
McKay Iron and Locomotive Works.....Jersey City, N J.
Portland Company.....Portland, Me.
Porter, Bell & Co. (light locomotives).....Pittsburg, Pa.
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Rogers Locomotive Works.....Paterson, N. J.
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Manufacturers of and Dealers in all kinds of

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MACHINERY,

Steam Engines and Mechanical Supplies.

Locomotive and Car Builders' Machinery a Specialty.

No. 59 SUDBURY STREET, BOSTON.

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Buffalo Steam Gauge & Lantern Co.

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LOCOMOTIVE HEAD LIGHTS,

TAIL LAMPS,

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TARGET AND GAUGE LAMPS, ETC.

DEALERS IN

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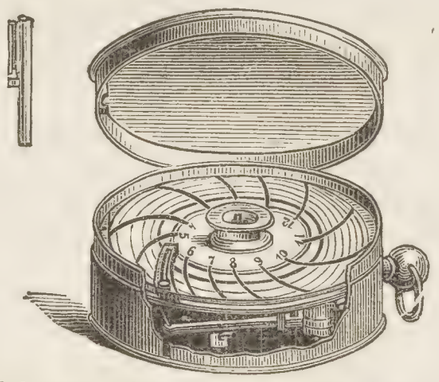
Manufactory and Office, corner Washington and Perry Streets,

BUFFALO, N. Y.

Reflectors Re-plated, Gauges of all kinds and Locomotive Balances Repaired at Short Notice.

Improved Watchman's Time Detectors.

U. S. Patents, December 28, 1869; April 22, 1873; August 2, 1874; October 20, 1874; November 10, 1874.



These Detectors are the Newest and most Complete invented. They are portable, and constructed in such a way that for each station to be controlled only a Key is necessary outside or inside the building. By this Watch the watchman can be controlled, how often and at what exact minute he has visited the different buildings or places (up to twelve) confided to his care.

The reliability and usefulness of these watches have been certified and confirmed by many proprietors of large establishments, as can be seen by certificates filed in our office. **Price $75, C.O.D.**

IMHAEUSER & CO.,

212 Broadway, P. O. Box 4798, *NEW-YORK.*

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Cliff St., between John and Fulton,

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IMPORTERS AND DEALERS IN

Tin and Roofing Plates,

OF ALL SIZES AND KINDS.

Pig, Tin, Russia Sheet-Iron, Charcoal and Common Sheet-Iron, Lead, Sheet Zinc, Copper, Spelter, Solder, Antimony, Etc.

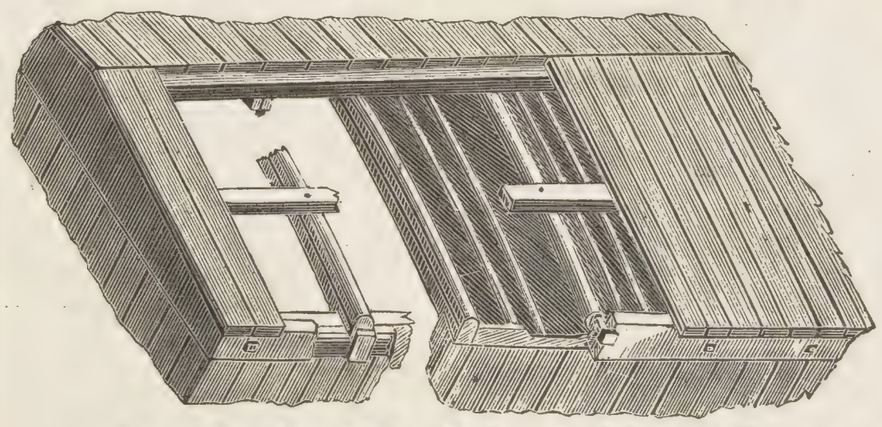
MANUFACTURERS OF

Copper, Brass and Wire.

WINSLOW CAR ROOFING CO.,

PROPRIETORS OF

WINSLOW IRON CAR ROOF.



Office, 211 Superior Street.

MANUFACTORY,

No. 39 Union Street,

CLEVELAND, OHIO.

Over 40,000 Cars now in service covered with this roof. It will last, without repairing, as long as the car it covers, and is more economical by one half than any roof in use.

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OF
MASTER-MECHANICS AND MASTER CAR-BUILDERS
THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* Mechanical Engineer. † Mechanical Superintendent. ‡ General Master-Mechanic. †† Gen. Master Car-Builder. § Master of Machinery. ‖ General Foreman. ** Superintendent of Machinery. §§ Superintendent of Motive Power and Machinery. ‖‖ Superintendent of Rolling Stock. ‡‡ Supt. Cars and Buildings.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
A			
Adirondack	Jacob Myers	James J. Traver	Saratoga, N. Y.
Alabama Central	E. M. Smith	E. M. Smith	Selma, Ala.
Albany & Susquehanna	R. C. Blackall	R. C. Blackall	Albany, N. Y.
Alexandria, Nebraska & Iowa	Geo. Q. Adams		Alexandria, Mo.
Arkansas Central	A. H. Johnson	A. H. Johnson	Helena, Ark.
Atchison, Topeka & Santa Fe	H. V. Farris		Topeka, Kan.
Atchison & Nebraska	Selah Williams		Atchison, Kan.
Alabama & Chattanooga	T. H. Kennedy		Chattanooga, Tenn.
Allegheny Valley	G. W. Glass	R. Gunning	Pittsburg, Pa.
Atlanta & Richmond Air-Line	G. H. Gramling		Atlanta, Ga.
Atlanta & West-Point	Wm. Rushton		Atlanta, Ga.
Atlanta & West-Point		R. D. Cole	Newnan, Ga.
Atlantic & Gulf	C. E. Van Vorst	P. N. Raynal	Savannah, Ga.
Atlantic & North-Carolina	E. J. Clayton	E. J. Clayton	New-Berne, N. C.
Atlantic & Great Western	J. A. Cooper	†J. H. F. Wiers	Meadville, Pa.
Atlantic & Great Western	‡William Fuller	D. S. Dockstader	Meadville, Pa.
Atlantic & Great Western	N. Wright	W. G. Haggard	Cleveland, Ohio.
Atlantic & Great Western		S. V. Smith	Kent, Ohio.
Atlantic & Great Western	William Hill	J. W. Holmes	Galion, Ohio.
Atlantic & Great Western	‖J. B. Miller		Shenango, Pa.
Atlantic & Pacific & Missouri Pacific	§§John Hewitt	J. Hodge	St. Louis, Mo.
Atlantic & Pacific & Missouri Pacific	‖R. D. Grant		St. Louis, Mo.
Atlantic, Mississippi & Ohio			
Norfolk & Petersburg Division	J. S. Whitworth	J. S. Whitworth	Norfolk, Va.
South Side of Virginia "	J. T. Robinett	J. T. Robinett	Petersburg, Va.
Virginia & Tennessee "	F. Sterk	W. A. Morgan	Lynchburg, Va.
Virginia & Kentucky "			
B			
Baltimore & Ohio	§John C. Davis	J. S. Shryack	Baltimore, Md.
Baltimore & Ohio	A. J. Cromwell	James H. Miller	Baltimore, Md.
Baltimore & Ohio	Wm. Edwards		Martinsburg, Va.
Baltimore & Ohio	S. A. Silver		Piedmont, Va.
Baltimore & Ohio	E. W. Lippencott	H. Longest	Grafton, W. Va.
Baltimore & Ohio	E. L. Weisgarber	‖C. Ditman	Wheeling, W. Va.
Central Ohio Division	Alex Platt		Zanesville, O.
S'dusky, Mans., & New'k Div.	Wm. Y. Johnson		Sandusky, O.
Central Ohio Division	§Sam. Houston		Newark, O.
Central Ohio Division	James Stewart		Newark, O.
Central Ohio Division	O. B. Perkins		Columbus, O.
Chicago Division	Geo. Wilson		Chicago, Ill.
Bangor, Old Town & Milford	J. B. Peckham	John H. Brown	Bangor, Me.
Bangor & Piscataquis	Horace Penny	J. W. Comins	Old Town, Me.
Bellefonte & Snow-Shoe	H. D. Landis	H. D. Landis	Bellefonte, Pa.
Belvidere & Delaware	R. McDowell	John Silvers	Lambertville, N. J.
Boston & Albany	Wilson Eddy	F. D. Adams	Springfield, Mass.
Boston & Albany	A. B. Underhill		Boston, Mass.
Boston & Albany		W. E. Chamberlain	Allston, Mass.
Boston, Barre & Gardner	John Loyer		Worcester, Mass.
Boston & Providence	George Richards	John Lightner	Roxbury, Mass.
Boston, Clinton & Fitchburg	John Webster	Samuel Stevens	Fitchburg, Mass.
Boston, Concord & Montreal	Ralph Adams	M. R. Elkins	Lake Village, N. H.
Boston & Maine	F. A. Waitt		Boston, Mass.
Boston & Maine		D. C. Richardson	Lawrence, Mass.
Boston, Lowell & Nashua	J. F. Crockett	T. G. Davis	Boston, Mass.
Boston, Lowell & Nashua		S. A. Davis	Nashua, N. H.
Brockville & Ottawa	H. J. Marshall	H. J. Marshall	Brockville, Can.
Brunswick & Albany	M. Thornton		Brunswick, Ga.
Burlington & Missouri River in Neb.	J. Christiansen	J. Christiansen	Plattsmouth, Neb.
Burlington, Cedar Rapids & Minn.	R. W. Bushnell	R. W. Bushnell	Cedar Rapids, Iowa.
Buffalo, New-York & Phila.	Allen Vail.		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. J. Bookhammer	John Monks	Oil City, Pa.
C			
Cairo & Vincennes	R. Williams		Cairo, Ill.
California Pacific	A. J. Stevens	D. Rutherford	So. Vallejo, Cal.
Camden & Amboy	F. B. Stevens		Hoboken.
	T. T. Kerr	E. Lockwood	Bordentown, N. J.
	Thomas Single		South-Amboy.
Camden & Atlantic	Rufus Hill	S. Wills.	Camden, N. J.
Canada Southern and Branches	‡‡C. E. Benton	††C. E. Benton	St. Thomas, Canada.
Carolina Central	W. A. Gill	Thos. Myers.	Laurinburg, N. C.
Catawissa	Wm. Ellis	C. D. Ellis	Catawissa, Pa.
Catasauqua & Foglesville	Thomas Evans	Chas. J. Holbach	Catasauqua, Pa.
Central of Georgia	D. D. Arden	C. C. Millar	Savannah, Ga.
Central of New-Jersey	*T. W. Peeples	George Hackett	Elizabethport, N. J.
Lehigh & Susquehanna Div.	L. C. Brastow	L. C. Brastow	Wilkesbarre, Pa.
Central Branch Union Pacific	Geo. C. Benedict		Atchison, Kansas.
Central R. R. of Iowa		T. L. Seevers	Marshalltown, Iowa.
Central R. R. of Iowa	F. B. Woodruff.		Eldora, Iowa.
Central Pacific	A. J. Stevens	Benjamin Welch	Sacramento, Cal.
Western Division	Geo. D. Welch	J. J. Lawler	Oakland Cal.
Visalia Division	S. Johnson		Lathrop, Cal.
Sacramento Division	M. W. Cooley		Rocklin, Cal.
Sacramento Division		Nat. Webb	Truckee, Cal.
Truckee Division	James Velsir	Wm. McPherson	Wadsworth, Nev.
Humboldt Division	H. L. Stevenson	H. B. Hartsman	Carlin, Nevada.
Salt Lake Division	W. H. McKenzie	G. J. Turner	Ogden, Utah.
California Pacific Division	D. Rutherford	D. Rutherford	Vallejo, Cal.
Charleston & Savannah	H. T. Calder		Charleston, S. C.
Chesapeake & Ohio	W. G. Freeman	J. N. King	Richmond, Va.
Chesapeake & Ohio	§T. J. Hamer	H. C. Bassinger	Huntingdon, W. Va.
Cheraw & Darlington	D. W. Haines	A. M. Corrie	Florence, S. C.
Champlain Trans. Co	H. T. Calder		Burlington, Vt.
Cheshire & Ashuelot	F. A. Perry	F. A. Perry	Keene, N. H.
Charlotte, Columbia & Augusta	Robert King	J. C. Troeger	Columbia, S. C.
Chicago & Pacific	A. S. Gurnee		Chicago, Ill.
Chicago & Lake Huron			
Eastern Division	E. Hollis		Port Huron, Mich.
Western Division	W. C. Faulkner		Battle Creek, Mich.
Chicago & North-Western	§Geo. W. Tilton	William Campbell	Chicago, Ill.
Wiscon. Mad. & Mill. Divis		Wm. Campbell	Chicago, Ill.
Wiscon. Mad. & Mill. Divis.		Henry Hull	Fond du Lac, Wis.
Galena Division		Hugh Gray	Chicago, Ill.
Iowa Division	C. C. Elliott	Richard Wharton	Clinton, Iowa.
Peninsula Division	Geo. White		Escanaba, Mich.
Chicago & Alton	John A. Jackman	R. Reniff	Bloomington, Ill.
Chicago, Burlington & Quincy	‡Wm. Wilson	††W. W. Wilcox	Aurora, Ill.
Galesburg Division	James Lamb	H. J. F. Small	Galesburg, Ill.
Creston Division	Joel West		Creston, Iowa.
Burlington Division	John Bassler		Burlington, Iowa.
Chicago, Clinton & Dubuque	P. R. Sutton		Dubuque, Iowa.
Chicago, Dubuque & Minnesota	P. R. Sutton		Dubuque, Iowa.
Chicago, Rock Island & Pacific	T. B. Twombly	B. K. Verbryck	Chicago, Ill.
Chicago & Michigan Lake Shore	T. J. Hartswell	D. Sutherland	St. Joseph, Mich.
Chicago, Danville & Vincennes	J. B. Morgan		Danville, Ill.
Chicago, Milwaukee & St. Paul			
La Crosse & P. Du Chien Div.		Wm. E. Kittredge	Milwaukee, Wis.
Northern Div		John Bailie	Milwaukee, Wis.
Iowa & Minn. Div	J. Pettee	J. Pettee	Minneapolis, Minn.
Hastings & Dakota Division	C. C. Clements.		Hastings, Minn.
Chicago & Iowa	H. S. Bryan		Aurora, Ill.
Cincinnati, Wabash & Michigan	E. M. Porter		Wabash, Ind.
Cincinnati, Hamilton & Dayton	James Eckford	W. H. H. Allison	Cincinnati, Ohio.
Indianapolis Division	Edward Moore		Indianapolis, Ind.
Cincinnati, Lafayette & Chicago	Charles E. Gore.		Lafayette, Ind.
Cincinnati & Muskingum Valley	Leroy Kells	Daniel Jewell	Lancaster, Ohio.
Cincinnati, Sandusky & Cleveland	J. M. Sanborn		Sandusky, Ohio.
Cleveland, Col., Cin. & Indianapolis	‡L. S. Young	††William F. Smith	Cleveland, Ohio.
Indianapolis Division	A. R. McAlpine		Galion, Ohio.
Indianapolis Division		R. Attridge	Indianapolis, Ind.
Cincinnati Division	D. Carmichael	D. Carmichael	Delaware, Ohio.
Columbus Division	F. G. Kaufholz	Wm. Cleve	Cleveland, Ohio.
Cleveland & Pittsburg	N. E. Chapman	A. Steinbrunner	Cleveland, Ohio.
Cleveland, Mt. Vernon & Delaware	J. W. Holloway	J. W. Holloway	Akron, Ohio.
Cleveland, Tuscarawas Val. & Wheeling	W. F. Turreff		Cleveland, O.
Cobourg, Peterboro & Marmosa	Wm. Polson		Cobourg, Canada.
Columbus, Chicago & Indiana Central		(See Pitts. Cinn. & St. Louis)	
Columbus & Hocking Valley	H. S. Wallace	H. S. Wallace	Columbus, Ohio.
Concord	Chs. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Portsmouth	C. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Claremont	J. N. Lander	A. Langmaid	Concord, N. H.
Connecticut River	§Wm. H. Stearns.		Springfield, Mass.
Connecticut Valley	C. W. Hollister	N. A. Smith	Hartford, Ct.
Connecticut Western	N. Slingland.		Hartford, Ct.
Contoocook River			Concord, N. H.
Conn. & Passumpsic Rivers	Geo. Kilby		Lyndonville, Vt.
Corning, Cowanesque & Antrim	O. C. Patchell	O. C. Patchell.	Corning, N. Y.
Cumberland Valley	A. S. Hull	C. W. Nitterhouse	Chambersburg, Pa.
Cumberland & Pennsylvania	W. L. Jordan	Nathan Binnix	Mt. Savage, Md.
D			
Dakota Southern	Jas. Whitney	A. A. Meckling	Yankton, Dak.
Danbury & Norwalk	Charles A. Craig	C. A. Craig	Danbury, Ct.
Davenport & St. Paul	James Russell		Davenport, Iowa.
Dayton & Union	A. J. Keenan	J. F. Feicht	Dayton, Ohio.
Dayton & Michigan	John Black	W. H. H. Allison	Cincinnati, Ohio.
Delaware, Lackawanna & Western	Walter Dawson	Robert McKenna	Scranton, Pa.
Morris & Essex Division	W. H. Lewis	L. S. Barber	Hoboken, N. J.
Denver & Rio Grande	John Greenwood		Denver, Col.
Detroit, Ft. Wayne & Logansport	W. A. Carpenter		Bankers, Mich.
Detroit & Milwaukee	C. M. Hanson		Detroit, Mich.
Detroit, Lansing & Lake Michigan	Tho. E. Roberts		Ionia, Mich.
Delaware & Hudson Canal Co.	‖‖R. C. Blackall		Albany, N. Y.
Dorchester & Delaware			Cambridge, Md.
Dubuque South-Western	James Rollo	James Rollo	Farley, Iowa.
Dutchess & Columbia	W. G. Vanbuskirk	H. A. Webster	Fishkill, N. Y.
Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett.	Dunkirk, N. Y.
E			
Eastern		J. P. Somerby	Salem, Mass.
Eastern	John Thompson.		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L. Weaver	Riverton, Ky.
East-Tennesee, Virginia & Georgia	C. A. Hodge		Knoxville, Tenn.
Erie Railway	§§Frank K. Hain		Susquehanna, Pa.
Erie Railway	Robert Wallace		Susquehanna, Pa.
Erie Railway	V. Blackburn		Jersey City, N. J.
Erie Railway	F. M. Wilder	M. Wilder	Buffalo, N. Y.
Erie Railway	J. W. Chapman	J. W. Chapman	Hornellsville, N. Y.
Erie Railway		‖D. B. Goodell	Elmira, N. Y.
Erie Railway		‖J. B. Hill	Jersey City, N. J.
Erie Railway	J. Van Vechten	‖J. Van Vechten	Port Jervis, N. Y.
Erie Railway	A. T. Back		Rochester, N. Y.
Erie & Pittsburg	—G. J. Parkin	G. J. Parkin	Erie, Pa.
European & North Am. (of Maine)	A. O. Bailey	J. H. Brown	Oldtown, Maine.
Evansville & Crawfordsville	John L. White	Joseph Stiker	Evansville, Ind.
Evansville, Terre Haute & Chicago	§§Wm. Riley, Jr.		Terre Haute, Ind.
F			
Fitchburg	Geo. A. Cooledge	Enos Varney	Charlestown, Mass.
Fitchburg & Worcester	John Webster	Samuel Stevens	Fitchburg, Mass.
Flint & Pere Marquette	Sanford Keeler	‖R. B. More	East-Saginaw, Mich.
Florida	Ezra Gray	G. Hernandez	Fernandina, Fla.
Flushing & North Shore	Wm. La Suer	C. Wilkinson	Hunter's Point, L. I.
G			
Galveston, Harrisburg & San Antonio	Palmer Cady		Harrisburg, Texas.
Galveston, Houston & Henderson	Jno. G. Coulon	Wm. Macbeth	Galveston, Texas.
Georgia	William Hardman	T. M. Preval,	Augusta, Ga.
Gilman, Clinton & Springfield	W. B. McKenna		Springfield, Ill.
Grand Tower & Carbondale.	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk		Warren Noyes	Gorham, Me.
Grand Trunk	†Herbert Wallis	Wm. McWood	Montreal, Canada.
Grand Trunk.			Sherbrooke, Can.
Grand Trunk.		B. J. Mitchell	Portland, Me.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne, Ind.
Great Western of Canada	†Wm. A. Robinson	F. Childs	Hamilton, Canada.
Green Bay & Lake Pepin	J. H. Erwin		Green Bay, Wis.
Greenville & Columbia	R. H. Anderson	R. H. Anderson	Helena, S. C.
H			
Hackensack & New-York	Abra'm Angausen		Hackensack, N. J.
Hanover Branch	John J. Bingley	Henry Britcher	Hanover, Pa.
Hannibal & St. Joseph	**Jno. MacKenzie		Hannibal, Mo.
Hartford, Providence & Fishkill	Edwin Garfield	V. D. Perry	Hartford, Ct.
Housatonic	C. R. Morris.	J. J. Ferris	Falls Village, Ct.
Houston & Texas Central	L. C. Noble	James McGee	Houston, Texas.
Houston & Texas Central		S. H. McElroy	Houston, Texas.
Huntington & Broad-Top Mountain	W. W. Coller	M. Tellerhoof	Saxton, Pa.
I			
Illinois Central	**S. J. Hayes	W. B. Snow	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia, Ill.
North Division	J. B. Edams		Amboy, Ill.
Iowa Division	Thomas W. Place		Waterloo, Iowa.
Illinois Midland	J. G. Clifford	G. Clifford	Paris, Ill.
Illinois & St. Louis.	James Hazen		Bellville, Ill.
Indianapolis, Cincinnati & Lafayette	J. S. Patterson	S. Griffith	Cincinnati, Ohio.
Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Indianapolis & St. Louis	A. J. Sanborn		Mattoon, Ill.
Indianapolis, Bloomington & Western	Tho. V. Losee	A. J. Allen	Urbana, Ill.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ia.
International & Great Northern	R. B. Small		Palestine, Texas.
Intercolonial	Wm. Whitney	Edw. Shaffer	Moncton, N. B.
Iron	Perry Scott	Clem. Roetling	Ironton, Ohio.
Ithaca & Athens	F. A. Brown.		Ithaca, N. Y.
J			
Jacksonville, Pensacola & Mobile	H. D. Kennedy		Jacksonville, Fla.
Jeffersonville, Madison & Indiana	Reuben Wells.		Jeffersonville, Ind.
Junction & Breakwater	J. A. Maguire.		Lewes, Del.
K			
Kalamazoo, Allegan & Grand Rapids			Kalamazoo, Mich.
Kansas City, St. Joseph & Council Bluff	Wm. D. Rowley	Wm. D. Rowley	St. Joseph, Mo.
Kansas Central	Samuel Black		Leavenworth, Kan.
Kansas Pacific	**L. H. Waugh		Wyandotte, Kansas.
Denver Pacific Div	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div.	**L. H. Waugh		Wyandotte, Kansas.
Junction City & Ft. Kearney Div	**L. H. Waugh		Wyandotte, Kansas.
Arkansas Valley Div	**L. H. Waugh		Wyandotte, Kansas.
Kentucky Central	J. R. Ledyard	J. L. Hackathorn	Covington, Ky.
Keokuk & Des Moines Valley	S. W. Wakefield	M. Sessions	Keokuk, Iowa.
King's Mountain	E. Thomas	E. Thomas	Chester, S. C.
Knox & Lincoln	§§E. R. Hamlin	Benj. Soule	Bath, Me.
Knoxville & Charleston			Knoxville, Tenn.
L			
Lackawanna & Bloomsburg	Chas. Graham	Chas. Graham	Kingston, Pa.
Lake Erie & Louisville	John Pero		Fremont, Ohio.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Lake Ontario Shore	Wm. Harris		Oswego, N. Y.
Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland, Ohio
Michigan Southern Division	Geo. W. Stevens		Elkhart, Ind.
" " "		S. S. Knapp	Adrian, Mich.
Toledo Division	Albert Congdon	Frank O. Bray	Norwalk, Ohio.
Erie Division	L. O. Gassett	J. Withyecombe	Cleveland Ohio.
Buffalo Division	W. L. Wallace	A. C. Robson	Buffalo, N. Y.
Lake Superior & Mississippi			St. Paul, Minn.
Lehigh Valley	John I. Kinsey		South-Easton, Pa.
Lehigh Valley	P. Hofecker	E. R. Brown	Weatherly, Pa.
Lehigh Valley	John Campbell	Mauch Chunk, Pa.	Delano, Pa.
Lehigh Valley	D. Clark		Hazleton, Pa.
Leavenworth, Lawrence & Gal	J. S. McCrum		Lawrence, Kansas.
Little Rock & Fort Smith	D. R. Wing	D. R. Wing	Argenta, Ark.
London & Port Stanley			London, C. W.
Louisville, New-Albany & Chicago	Geo. Ruhlandt	Geo. Helfrich	New-Albany, Ind.
Long Island	Chs. A. Thompson	C. A. Thompson	Hunter's Point, L I.
Louisville, Cincinnati & Lexington	S. S. Pilson	S. S. Pilson	Louisville, Ky.
Louisville & Nashville	†Thatcher Perkins		Louisville, Ky.
Louisville & Nashville	D. P. Rennie	Isaac M. Owens	Louisville, Ky.
Louisville & Nashville	Jas. Montgomery		Bowling Green, Ky.
Nashville & Decatur Division	John Skidmore		Nashville, Tenn.
South & North Ala. Div	Thos Jeffers	W. L. Gude	Birmingham, Ala.
South & North Ala. Div	C. H. Beale		Montgomery, Ala.
Memphis & Ohio Div	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Louisville, Paducah & So. Western	W. D. Robb	F. A. Felton,	Elizabethtown, Ky.

M

Macon & Augusta			Macon, Ga.
Macon & Brunswick	R. Wagnon	R. Wagnon	Macon, Ga.
Macon & Western	D. M. Gogel	James A. Knight	Macon, Ga
Maine Central	J. W. Philbrick	J. W. Philbrick	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div	John Ellis	C. H. Kenison	Augusta, Me.
Maine Central Division	John F. Merrill.		Waterville Me.
Manchester & Lawrence	Chas. L. Eastman.	M. W. Dickerman.	Concord, N. H.
Marietta, Pittsburg & Cleveland	W. J. Adams		Marietta, Ohio.
Marietta & Cincinnati	E. Bosley	E. Bosley	Chillicothe, Ohio.
Marquette, Houghton & Ontonagon	C. J. Shellhorn	H. D. Lyons	Marquette, Mich.
Maryland & Delaware	Samuel Peters		Greensboro, Md.
Memphis & Little Rock	Tho. Rennell	P. Twitchell	Argenta, Ark
Memphis & Charleston	A. Ross	A. W. Drew	Memphis, Tenn
Memphis & Charleston	H. N. Burford	Fabien Varin	Huntsville, Ala.
Mineral Point	Robert Hay	Robert Hay	Mineral Point, Wis.
Mineral Range	C. H. Fox		Hancock, Mich.
Mississippi & Tennessee	Geo. Haszinger	J. Riny	Memphis, Tenn.
Michigan Central	§§Geo. S. Chalender.	Geo. S. Chalender	Jackson, Mich.
Michigan Central		Henry Whiting	Detroit, Mich.
Midland Pacific	A. C. Stiles		Lincoln, Neb.
Mississippi Valley & Western	J. S. Pickering		Canton, Mo.
Missouri, Iowa & Nebraska	J. G. Crozier		Alexandria, Mo.
Missouri, Kansas & Texas	T. G. Gorman		Parsons, Kan.
Missouri, Kansas & Texas		J. Townsend	Sedalia, Mo.
Missouri, Kansas & Texas	J. E. Wiggins		Hannibal, Mo.
Missouri River, Fort Scott & Gulf	John S. McCrum	Alex. Montier	Kansas City, Mo
Mobile & Montgomery	James McFarland.	L. Barham	Montgomery, Ala.
Mobile & Girard	C. D. Wall		Girard, Ala.
Mobile & Ohio		John McHugh	Mobile, Ala.
Mobile & Ohio	R. McDougal	I. T. Booth	Whistler, Ala.
Mobile & Ohio	B. S. Herring		Macon, Miss.
Mobile & Ohio	R. H. Briggs		Jackson, Tenn.
Montgomery & West-Point	J. McVey	J. T. Daniels	Montgomery, Ala.
Montgomery & Eufaula	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Algiers, La.
Montreal Northern Colonization	§§C. G. C. Simpson		Montreal, Can.

N

Nashville & Chattanooga	John U. Eastman.	J. G. Sawyer	Nashville, Tenn.
Naugatuck	Henry Hanford	George W. Gray	Bridgeport, Ct.
New-Bedford	G. W. Reynolds.	Robert Chase	Taunton, Mass.
New-Brunswick	P. Logan	C. M. Kinnon	Fredericton, N. B.
New-Brunswick & Canada	Tho. Armstrong	G. Houlton	St. Andrew's, N. B.
New-Haven & Northampton	Henry Fox.	Henry Fox.	New-Haven, Ct.
New-Jersey Midland	C. J. Clifford.		Wortendyke, N.J.
New-Jersey Southern.	Rufus Blodgett.		Manchester, N. J.
New-Orleans & Ohio	John R. Jordan.	John R. Jordan.	Paducah, Ky
New-Orleans, St. Louis & Chicago		‡‡J. D. Billings	McComb City. Miss.
New-Orleans, St. Louis & Chicago	§§L. H. Sellars.		Water Valley, Miss.
New-Orleans, St. Louis & Chicago		G. H. White	McComb City, Miss.
New-Orleans & Mobile	§Josiah Bettis	D. C. Roland	Mobile, Ala.
New-York, Kingston & Syracuse	A. Q. Mackenbush.	G. Dikeman	Syracuse, N. Y.
New-York & Harlem.	Wm. M. Strong	C. E. Garey	New-York.
New-York Central & Hudson River		††Leander Garey.	New-York.
New-York Central Division	‡G. B. Van Vorst	D. Hoit	West-Albany, N. Y.
New-York Central Division	Henry Watkeys.		Syracuse, N. Y.
New-York Central Division	Amos Gould	James Leary.	Rochester, N. Y.
New-York Central Division	Jas. Butman	Wm. Johnson	Buffalo, N. Y.
New-York Central Division	S. L. White	George Rowe	Niagara Falls, N. Y
Hudson River Division	‡Wm. Buchanan.	E. A. Olmstead.	New-York City.
Hudson River Division	R. Greenalch	J. J. Conaghty	E. Albany, N. Y.
New-York, Boston & Montreal	W. G. Van Buskirk	H. A. Webster	Dutchess Junc., N.Y
New-York & Oswego Midland	§§W. A. Dripps		Oswego, N. Y.
Eastern Division	J. Minchell		Middletown, N. Y.
Middle Division	Tho. Howard		Norwich, N. Y.
Northern Division	Edward Van Vleck.	T. D. Day	Oswego, N. Y.
New-York & New-England	Geo. E. Boyden.	Elias E. Pratt	Boston, Mass.
New-York, Providence & Boston.	Jas. H. Anderson.	Jas. H. Anderson.	Providence, R. I.
New-York, New-Haven & Hartford	§§H. Kittendorf	James Denver	New-Haven, Ct.
New-York, New-Haven & Hartford	J. O. Chapman	F. Leppens	Hartford, Ct.
Northern Central	§§Howard Fry		Williamsport, Pa.
Northern Central		G. W. Demarest.	York, Pa.
Northern New-Hampshire	James W. Lander.	Albert Langmaid.	Concord, N. H.
Northern of Canada	P. Clark.	P. Clark	Toronto, Can.
Northern Pacific	**H. A. Towne		St. Paul, Minn.
Minnesota Division	W. H. Lewis	W. S. Heathcote	Brainerd, Minn.
Lake Superior & Miss. Div	G. H. Smith	John Hill	St. Paul, Minn.
Dakota Division	C. W. Rossiter		Fargo, D. T.
Pacific Division	J. F. Curtis		Kalama, W. T.
North-Carolina	Rufus D. Wade	B. G. Sergeant	Co. Shops, N. C.
North-Louisiana & Texas	C. H. Tull		Monroe, La.
North-Lebanon		Henry B. Oves	Lebanon, Pa.
North-Pennsylvania	Franklin Roop	Franklin Roop	Philadelphia, Pa.
North-Eastern	D. W. Haines	A. M. Corrie	Florence, S. C.
Norwich & Worcester	Richard Colburn	G. R. Bentley	Norwich, Ct.

O

Ohio & Mississippi		G. Hibbert	Cochran, Ind.
Ohio & Mississippi	‡J. D. W. Potts		Seymour, Ind.
Oil City & Pithole	George Thompson		Pithole, Pa.
Oil Creek & Alleghany River	H. J. Bookhammer.	John Monks	Oil City, Pa.
Old Colony & Newport	J. K. Taylor	A. Gleason	Boston, Mass.
Oregon & California	§§J. Brandt.		Portland, Oregon.
Owensburg & Russellville	J. R. Osborne		Owensburg, Ky.

P

Paducah & Memphis	Alex. Forsyth		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Panama	Chas. E. Stewart		Aspinwall, N. G.
Pacific of Missouri	§§John Hewitt	E. Martin	St Louis, Mo.
Pennsylvania	§§T. N. Ely		Altoona, Pa.
Pennsylvania	H. D. Garrett	I. W. Van Houten.	W. Philadelphia, Pa.
Pennsylvania	E. L. Caum	Samuel W. Myers.	Harrisburg, Pa.
Pennsylvania	G. W. Strattan	John P. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver	R. S. Ramsey	Pittsburg, Pa.
New-Jersey Division	L. A. Bosdevex	E. Lockwood	Meadow Shops, N. J.
New-Jersey Division.		David H. Baker	Jersey City, N. J.
West-Penn. Division	C. B. Street	M. H. Fales	Blairsville, Pa.
Peoria & Rock Island	Geo. Gregg		Peoria, Ill.
Peoria, Pekin & Jacksonville	R. F. Hurd	R. F. Hurd	Pekin, Ill.
Petersburg & Weldon	R. B. Andrews	Alex. Wright	Petersburg, Va.
Philadelphia, Wilmington & Baltimore	S. A. Hodgman.	Wm. T. Worth	Wilmington, Del.
Philadelphia & Baltimore Central	S. D. Danfield.	Samuel D. Danfield.	Chester, Pa.
Philadelphia and Erie	Martin Walls		Sunbury, Pa.
	W. L. Forster		Renovo, Pa.
	W. L. Holman		Kane, Pa.
	W. T. Smith.		Erie, Pa.
	§§Howard Fry		Erie, Pa.
Philadelphia & Reading	L. B. Paxson	Aaron Steinbach.	Reading, Pa.
Germantown & Norris'n Div	Jackson Richards		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis	E. Pierce	D. F. Andregg	Dennison, Ohio.
Pittsburg & Columbus Division		Thos. D. Furgusen.	Steubenville, Ohio.
Little Miami Division		M. P. Ford	Columbus, Ohio
Little Miami Division	J. H. Setchel		Cincinnati, Ohio.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlin	Columbus, Ohio.
Col., Cin. & Ind. Division	Geo. H. Prescott	Geo. H. Prescott	Logansport, Ind.
Pittsburg, Fort Wayne & Chicago	S. M. Cummings.	John Marquis.	Allegheny, Pa.
Pittsburg, Fort Wayne & Chicago	J. M. Boon.	Israel Lee	Fort Wayne, Ind
Pittsburg, Fort Wayne & Chicago		J. J. Kirkland	Crestline, Ohio.
Pittsburg, Virginia & Charlston	W. Lininger		Pittsburg, Pa.
Pittsburg, Washington & Baltimore	§Wm. Stearns		Connellsville, Pa.
Pittsburg, Washington & Baltimore	J. E. Sampsel	J. M. Leach.	Pittsburg, Pa.
Portland & Rochester	John G. Brady	John G. Brady	Portland, Me.
Portland & Oxford Central.	Geo. W. Battles.	Geo. W. Battles.	Buckfield, Me.
Portland, Saco & Portsmouth	John Donnell		Portland, Me.
Port Royal.	Wm. Campbell	E. Hubard	Port Royal, S. C
Port Hope, Lindsay & Beaverton	H. G. Taylor	H. G. Taylor	Port Hope, Can.
Portsmouth, Gt. Falls & Monmouth	James Tucker	E. Fall	Union Village, N.H.
Poughkeepsie & Eastern	John L Driscoll.	Jerry Wigg	Poughkeepsie, N. Y.
Providence & Worcester.	Joseph Kelly	Olney L. Smith	Providence, R. I.
Providence, Warren & Bristol	Rufus Smith	J. Brightman	Bristol, R. I.

Q

Quincy, Alton & St. Louis	J. O. Gravell	W. G. Gilbert	Quincy, Ill.
Quincy, Missouri & Pacific	W. F. Smith	W. F. Smith	Kirksville, Mo.

R

Raleigh & Gaston.	B. R. Harding	B. R. Harding	Raleigh, N. C.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Richmond, Fredericksburg & Potomac	H. Kuhn	W. H. Trainham	Richmond, Va.
Richmond, Danville & Piedmont	John McFarland	J. B. Vaughan	Richmond, Va.
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond, Va.
Richmond & York River	C. H. Harris	J. L. Thompson	Richmond, Va.
Rive De Loup	P. A. Logan	C. R. McKinnin	Fredericton, N. B.
Rome, Watertown & Ogdensburg	Abram Klohs	H. H. Sessions	Rome, N. Y.
Rome, Georgia	O. W. Harbin	O. W. Harbin	Rome, Ga.
Rochester & Genesee Valley	M. E. Brown.	M. Wilder	Buffalo, N. Y.
Rockford, Rock Island & St. Louis	Joseph Elder	T. F. Nolte	Beardstown, Ill.

S

Saginaw Valley & St. Louis	W. S. Thompson		Saginaw, Mich.
San Antonio & Mexican Gulf	W. T. Bingham		Victoria, Texas.
Savannah & Charleston	P. J. Hutson	J. D. Murphy	Charleston, S. C.
Seaboard & Roanoke	§§M. M. Pendleton		Portsmouth, Va.
Selma & Gulf	Wm. T. Daughtrey		Selma, Ala.
Selma, Rome & Dalton		W. W. Peirce	Selma, Ala.
Selma, Marion & Memphis	Dolphus Gay		Marion, Ala.
Sheboygan & Fond du Lac	John Hickey	John Hickey	Sheboygan, Wis
Sioux City & Pacific	C. H. Foster		Missouri Val., Iowa.
Southern Pacific of California	J. P. Wilson	F. N. Bellisle	San Francisco, Cal.
South-Carolina	W. B. Smith	John Reed	Charleston, S. C.
Southern Central	Chas. G. Brown	H. Mooney	Auburn, N. Y.
Southern, of Long Island	Mark Brear	C. Wilkinson	Brooklyn, N. Y.
Southern Minnesota			Wells, Minn.
South-Western of Georgia	C. D. Wall.		Columbus, Ga.
South-Western of Georgia	D. M. Gogel	James A. Knight	Macon, Ga.
South Shore	Warren E. Ray		Cohasset, Mass.
South Side of Long Island	A. P. Doane	A. P. Doane	Williamsburg, L. I.
Spartanburg & Union	J. N. Benner	Jacob Rice	Union C. H., S. C
Springfield, Athol & Northeastern	W. E. Granger		Springfield, Mass.
Stanstead, Shefford & Chambly	W. H. Smith		Waterloo, C. E.
Stockton & Ione		W. T. Hoyt	Stockton, Cal.
Stonington & Providence	J. H. Anderson.	J. H. Anderson	Providence, R. I.
St. Croix & Penobscot	Edward Bolton	A. G. Page	Milltown, Me.
St. Joseph & Denver City	E. Sleppy		St. Joseph, Mo.
St. Lawrence & Ottawa	Calvin Dame.	Calvin Dame.	Prescott, Canada.
St. Louis, Iron Mountain & Southern	O. A. Haynes	Oscar Doolittle	Carondelet, Mo.
Arkansas Division	L. Finlay.	L. Finlay	Little Rock, Ark.
St. Louis, Vandalia, T. Haute & Ind.	C. R. Peddle.	H. Kirmse	Terre Haute, Ind.
Indianapolis Division	Wm. Riley		Terre Haute, Ind.
Vandalia Division		A. J. Sanborn.	Effingham, Ind.
St. Louis, Alton & Terre Haute.	**Beriah Warren		St. Louis, Mo.
St. Louis & South-Eastern	L. B. Salisbury		Mt. Vernon, Ill.
Nashville Division	E. M. Hamstone		Edgefield, Tenn.
St. Paul & Pacific	J. C. Monroe	T. W. Heathcote	St. Paul, Minn.
St. Paul & Sioux City	F. C. Butterfield	J. W. Lydic	Shakopee, Minn.
St. Louis, Kansas City & Northern	W. H. Selby	C. S. Buck	Moberly, Mo.
St. Louis, Lawrence & Western	J. A. Hagan		Lawrence, Kan.
Sullivan & Erie			Tonawanda, Pa.
Syracuse, Binghamton & New-York	H. H. Dawson	David Burling	Syracuse, N. Y.
Syracuse Northern	W. Garrison	L. W. Smith	Syracuse, N..

T

Terre Haute & Indianapolis	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Tennessee & Pacific	William McKeand.	William McKeand.	Nashville, Tenn.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	J. A. Hanglin		Marshall, Texas
Tioga	Peres Bonny	D. H. Stratton	Blossburg, Pa
Toledo, Peoria & Warsaw	W. O. Hewitt	R. M. Hemphill	Peoria, Ill.
Toledo, Wabash & Western	§J. B. Morse		Fort Wayne, Ind
Toledo, Wabash & Western	John C. Wills.		Lafayette, Ind.
Toledo, Wabash & Western	Jacob Johann		Springfield, Ill.
Toledo, Wabash & Western		U. H. Kohler	Toledo, Ohio.
Toronto, Grey & Bruce.	Wm. Bowstead		Toronto, Can
Toronto & Nipissing	J. Haggus.		Toronto, Canada.
Troy & Boston	Foster Church	R. V. Coon	Troy, N. Y.

U

Union Pacific	§I. H. Congdon.	‡‡Geo. E. Stevens	Omaha, Nebraska.
Eastern Division		A. M. Collett	Omaha, Neb.
Eastern Division		H. P. Makely	Grand Island, Neb.
Mountain Divison		Jno. E. Davis	Cheyenne, W. T.
Laramie Division		Floyd Heavaner	Laramie, W. T.
Western Division		C. A. Phipps	Evanston, U. T.
Utah Central	Thos. Pierpont	Thos. Pierpont	Salt Lake City.
Utica & Black River	John Bailey.	David James	Utica, N. Y.
Utica, Chenango & Susquehanna	C. H. Brown		Utica, N. Y.

V

Vermont Central.	J. M. Foss	J. M. Foss	St. Albans, Vt.
Harlem Extension Div	C. S. Clapp	C. S. Clapp	Bennington, Vt.
New-London Northern Division	J. W. Dow	S. W. Caulkins	New-London, Ct.
Ogdensburg & L. Champlain Div.	William A. Short	J. R. Ames	Malone, N. Y.
Rutland Division	N. L. Davis		Rutland, Vt.
Vermont & Massachusetts		Jacob Marsh	Fitchburg, Mass.
Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.
Virginia & Truckee	Wm. Bowker		Carson, Nev.

W

Wash. City, Va. Midland & Gr. Southern	—— Waddy	J. T. Nalls	Alexandria, Va.
Washington & Ohio	Edward Dunn	Joshua Harrison	Alexandria, Va.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Welland	James Taylor	James Chase	St. Catharine, C. W.
Westchester & Philadelphia	John Moyer	N. Pawling	Philadelphia, Pa.
Western & Atlantic	John H. Flynn	Wm. Grambling	Atlanta, Ga.
Western Maryland	Wm. Lannan	J. H. Nussear	Union Bridge, Md.
Western North-Carolina	J. D. Hollister	J. D. Hollister	Salisbury, N. C.
Western R. R. N. C	M. W. Atkinson	M. W. Atkinson	Fayetteville, N. C.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
West-Feliciana	R. C. Brower	Wm. Grawling	Woodville, Miss.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
West-Wisconsin	Matt Ellis	J. C. Fischer	Hudson, Wis.
White Water Valley	A. W. Britton		Harrison, Ohio.
Wilmington, Columbia & Augusta	W. H. Turrintine		Wilmington, N. C.
Wilmington & Weldon	John Bissit	C. R. Clowe	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Wilmington & Reading	H. M. Missimer		Reading, Pa.
Winona & St. Peter	F. C. Ford	H. L. Preston	Winona, Minn.
Wisconsin Central	G. Campbell		Stevens' P't, Wis.
Worcester & Nashua	Albert Griggs.	Albert Griggs	Worcester, Mass

DIRECTORY
OF
Railway Superintendents and Purchasing Agents
THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director. ‡ Ass't. Gen. Supt. § Ass't Supt.

A

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Arkansas Central	James A. Tappan		Helena, Ark.
Alabama Central	John M. Bridges		Selma, Ala.
Albany & Susquehanna	*C. F. Young		Honesdale, Pa.
Atchison, Topeka & Santa Fe	C. F. Morse	C. F. Morse	Topeka, Kansas.
Atchison & Nebraska	J. F. Barnard	J. F. Barnard	St. Joseph, Mo.
Atchison & Nebraska	*Geo. H. Nettleton		Kansas City, Mo.
Alabama & Chattanooga	C. H. Stanton	T. J. Carlile	Meridan, Miss.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Pittsburg, Pa.
Atlanta & Richmond Air Line	R. Y. Sage		Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	J. H. Holway	Meadville, Pa.
First Division	J T. Odell		Meadville, Pa.
Second Division	A. L. Dunbar		
Third and Fourth Division	T. A. Phillips		Galion, Ohio.
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.
Allegheny Valley	J. J. Lawrence	John L. Awl	Pittsburg, Pa.
Adirondack	C. H. Ballard		Saratoga, N. Y.

B

Baltimore & Ohio	Thos. R Sharp	Benj. Williams	Baltimore, Md.
Central Ohio & Lake Erie Div	Wm. Walker		Columbus, Ohio.
Baltimore & Potomac	Geo. C. Wilkins	A. W. Sumner	Baltimore, Md.
Bangor & Piscataquis	M. H. Angel	L. H Eaton	Bangor, Maine.
Boston, Barre & Gardner	I. N. Ross		Worcester, Mass.
Boston & Albany	*Wm. Bliss.		Boston, Mass
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & Providence	A. A. Folsom	A. A. Folsom	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood		Fitchburg, Mass.
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A Dodge	Lyon & Vose	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood	Boston, Mass.
Boston, Lowell & Nashua	W. M. Parker.		Boston, Mass.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Brunswick & Albany	C. L. Schlatter		Brunswick, Ga.
Burlington & Missouri River (in Neb.)	Wm. Irwin.		Plattsmouth, Neb.
Burlington, Cedar Rapids & Minnesota	W W. Walker	S. L. Dows	Cedar Rapids, Ia.
Burlington & South-Western	R. T. Hosford		Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. H. Potter	N. M. Whitside	Corry, Pa.

C

Cairo & St. Louis	J. L. Hinkley	C. Ritsema	St. Louis, Mo.
Cairo & Vincennes	Henry L. Morrill		Cairo, Ill.
Camden & Atlantic	§F. A. Lister	J. L. Wendell	Camden, N. J.
Canada Central, Brockville, & Ottawa	H. P. Alden		Brockville, Can.
Canada Southern	*L. D Rucker		Toledo, Ohio.
Canada Southern		E. W. Porter	St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua, Pa.
Cayuga Lake	J. L. Grant		Ithaca, N. Y.
Central Branch Union Pacific	W. F. Downs	W. F. Downs	Atchison, Kan.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Central Pacific	‡John Corning		Sacramento, Cal.
Western Division	E. C. Fellows		Lathrop, Cal.
Visalia Division	E. C. Fellows		Lathrop, Cal.
Truckee Division	Frank Free		Wadsworth, Nev.
Humboldt Division	R. S. Matteson		Carlin, Nevada.
Oregon Divison	J. A. Fillmore		Sacramento, Cal.
Sacramento Division	J. A. Fillmore		Sacramento, Cal.
Salt Lake Division	R. H. Pratt		Ogden, Utah.
California Pacific Division	A. D. Wilder		Vallejo, Cal.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	Thos. Dodamead	J. A. Netherland	Richmond, Va.
Middle Division	H. D. Chapin		Staunton, Va.
Charlotte, Columbia & Augusta	James Anderson		Columbia, S. C.
Cheshire	R. Stewart	H. H. Stone	Keene, N. H.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt	R. W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	J. B. Mulliken.		Escanaba, Mich.
Madison Division	C. A. Swineford.		Baraboo, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis.
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver		Clinton, Iowa.
Western Iowa Division	John A. Head		Boone, Iowa.
Chicago & Alton	J. C. McMullen	A. V. Hartwell	Chicago, Ill.
Chicago, Burlington & Quincy	R. Harris	H. J. Higgins	Chicago, Ill.
Chicago Burlington & Quincy	‡C. H. Hudson		Chicago, Ill.
Eastern and Middle Division			Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota	C. Harris	F. I. Massey	Dubuque, Iowa.
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	*Geo. S. Bowen	James Penny	Chicago, Ill.
Chicago & Pacific	J. M. Whitman		Chicago, Ill..
Chicago & Paducah			Streator, Ill.
Chicago, Rock Island & Pacific	Hugh Riddle.	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chciago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.
Chicago & Michigan Lake Shore	*Geo. C. Kimball	Wm. R. Morrison	St. Joseph, Mich.
Chicago, Danville & Vincennes	L. Pearson	C. B. Mansfield	Chicago, Ill.
Chicago, Milwaukee & St. Paul	*S. S. Merrill	J. J. Slocum	Milwaukee, Wis.
Chicago, Pekin & Southwestern	W. P. Sisson		Streator, Ill.
Chicago & Canada Southern	D. Edwards		Toledo, Ohio.
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.
Cincinnati & Muskingum Valley	C. C. Wait		Zanesville, O.
Cincinnati, Richmond & Chicago	Lewis Williams		Cincinnati, Ohio
Cincinnati & Martinsville	T. C. Burnside		Franklin, Ind.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Cincinnati & Terre Haute			Terre Haute, Ind.
Cin., Cumberland Gap & Charleston	W. J Taylor		Knoxville, Tenn.
Cincinnati Hamilton & Dayton	Lewis Williams	P. Hickey	Cincinnati, Ohio.
Cincinnati, Hamilton & Indianapolis	Lewis Williams		Cincinnati, Ohio.
Cincinnati, Lafayette & Chicago	E. H. Waldron	G. G. Hadley	Lafayette, Ind.
Cincinnati, Sandusky & Cleveland	*D. W. C. Brown		Sandusky, Ohio.
Cleveland, Columbus, Cincinnati & Ind	E. S. Flint		Cleveland, Ohio.
Indianapolis Division	C. C. Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division.	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Cleveland, Mt. Vernon & Delaware.	G. A. Jones		Mt. Vernon, Ohio.
Cleveland, Tuscarawas Val. & Wheeling	*E. B. Thomas	W. W. Card, *Supt.*	Cleveland, Ohio.
Colorado Central	P. J. Nichols		Golden, Col.
Columbus & Hocking Valley	M. M Green		Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H.E.Chamberlin	H. E. Chamberlin	Concord, N. H.
Connecticut River	John Mulligan	John Mulligan.	Springfield, Mass.
Connecticut & Passumpsic Rivers	Geo. A. Merrill	Geo. Killey	Lyndonville, Vt.
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Corning, Cowanesque & Antrim	A. H. Gorton	R. J. Burnham	Corning, N. Y.
Cumberland Valley	I. F. Boyd	I. F. Boyd	Chambersburg, Pa.
Cumberland & Pennsylvania	J. A. Millholland		Mt. Savage, Md.

D

Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	J. R. Meckling	J. R. Meckling	Sioux City, Iowa
Davenport & St. Paul	N. H. Wood		Davenport, Iowa.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware & Hudson Canal Co	*C. F. Young		Honesdale, Pa.
Albany & Susq. Division	H. S. Morse		Oneonta, N. Y.
Rensselaer & Saratoga Div	H. B. Smith		Troy, N. Y.
Delaware, Lackawanna & Western		G.W. B. Cushing	New-York City.
Delaware, Lackawanna & Western	W. F. Halstead		Scranton, Pa.
Morris & Essex Division	Andrew Reasmer		Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus. Division	W. F. Hallstead		Utica, N. Y.
Denver & Rio Grande	W. W. Borst	W. S. Jackson	Denver, Col.
Detroit & Bay City	T. B. Sargent	D. A. Waterman	Detroit, Mich.
Detroit and Milwaukee	W. K. Muir	John S. Lorimer.	" "
Detroit, Hillsdale & Indiana	W. F. Parker.		Ypsilanti, Mich.
Detroit, Eel River & Illinois	A. B. Southard		Denver, Ind.
Detroit, Lansing & Lake Michigan	A. H. Reese.	C. D. Childs	Detroit, Mich.
Dorchester & Delaware	J. M. Murphy.		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer.	C. V DeForest	Dunkirk, N. Y.
Dubuque & South-Western.	J. P. Farley		Dubuque, Iowa.

E

East Alabama & Cincinnati	B. Boyle		Opelika, Ala.
East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern (Mass.)	*C. F. Hatch	C. W. Pratt	Boston, Mass.
Erie & Pittsburg	J. M. Kimball		Erie, Pa.
Erie Railway,	E. S. Bowen	Henry Bowman	New-York City.
Erie	P. P. Wright		Jersey City, N. J.
Eastern Division	E. O. Hill		Port Jervis, N. Y.
Delaware Division	Benj. Thomas		Port Jervis, N. Y.
Rochester Division	M. E. Brown		Rochester, N. Y.
Susquehanna Div.	C. W. Gardner		Elmira, N. Y.
Buffalo Division	R. G. Taylor		Buffalo, N. Y.
Western Division	J. S. Beggs		Buffalo, N. Y.
Erie & Pittsburg		Wm. Mullins	Pittsburg, Pa.
European & North-American	M. H. Angel	M. H. Angell	Bangor, Maine.
Evansville & Crawfordsville	John E. Martin.		Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.

F

Fitchburg	Chas.L.Haywood	John Adams	Boston, Mass.
Flint & Pere Marquette	Sanford Keeler	Geo. C. Cook	East-Saginaw, Mich.
Flushing & North-Shore	I. D. Barton		Hunter's Point, L. I.
Flushing & North-Shore		A. E. Godeffroy	New-York City.
Fort Wayne, Jackson & Saginaw	P. B. Loomis		Jackson, Mich.
Fort Wayne, Muncie & Cin	W. W. Worthington		Fort Wayne, Ind.

G

Galveston, Harrisburg & San Antonio	Hardy Eddins	J. W. Pierce	Galveston, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Georgia	S. K. Johnson	John Vaughn	Augusta, Ga.
Gilman, Clinton & Springfield	D. H. Conklin		Springfield, Ill.
Grand Rapids & Indiana	*C. E. Gorham		Fort Wayne, Ind.
S. Division	J. M. Matheany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich.
Grand Rapids & Indiana	*W. O. Hughart	William Mullins	Pittsburg, Pa.
Grand Trunk	*J. Hickson	John Taylor	Montreal, Canada.
East Division	Henry Bailey		Montreal, Canada.
West Division	W. J. Spicer		Toronto, Canada.
Grand Tower and Carbondale	H. V. Olyphant	Wm. W. Harris	Grand Tower, Ill.
Great Southern of Ga. & Fla	M. H. Alberger		Jacksonville, Fla.
Great Western (Canada)	Andrew Watson	Robert Beatty	Hamilton, Canada.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.

H

Hannibal & St. Joseph	L. W. Towne	L. W. Towne. / W. J. Hilton. / L. W. Morse.	Hannibal. Mo.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin	D. S. Draper	Bridgeport, Ct.
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	C. A. Burton		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top.	Geo. F. Gage	B. A. Knight	Huntingdon, Pa.

I

Illinois Central	Jos. F. Tucker		Chicago, Ill.
Illinois Central.	*Jas. C. Clarke	O. Ott	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois Midland	D. Hitchcock	‡P. Campbell	Terre Haute, Ind.
Illinois & St. Louis	W. K. McComas		St. Louis, Mo.
Indianapolis, Bloomington & Western	J. E. Gimperling		Indianapolis, Ind.
Indianapolis, Bloomington & Western	Geo. B. Wright, Receiver		Indianapolis, Ind.
Indianapolis, Cincinnati & Lafayette	Geo. L. Barringer	E. V. Cherry	Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna		Indianapolis, Ind.
Indianapolis & Vincennes		Wm. Mullins.	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward	J. W. Morse	St. Louis, Mo.
Indianapolis, Peru & Chicago	C. B. Robinson	D. Macy.	Indianapolis, Ind.
Michigan City Division	E. C. Murphy		La Porte, Ind.
Intercolonial Railway	Lewis Carvell	Sam. Watson	Moncton, N. B.
International & Great Northern	H. M. Hoxie		Houston, Texas.

J

Jacksonville, North-Western & S. E.	E. S. Greenleaf		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	Robert Walker		Jacksonville, Fla.
Jeffersonville, Madison & Indianapolis		Wm. Mullins	Pittsburg, Pa.
Jefferson, Madison & Indianapolis,	Horace Scott		Louisville, Ky.
Junction & Breakwater	Wm. Groom		Lewis, Del.

K

Kansas Central	W. R. Martin		Leavenworth, Kan.
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard	J. F. Barnard	St. Joseph, Mo.
Kansas City, St. Joseph & Council Bluffs	*Geo. H. Nettleton		Kansas City, Mo.
Kansas Midland	W. W. Fagan.		Topeka, Kan.
Kansas Pacific	O. S. Lyford		Kansas City, Mo.
Kansas Pacific	O. S. Lyford	J. L. Woods	St. Louis, Mo.
Kaw Valley Division	O. H. Dorrance		Lawrence, Kansas.
Smoky Hill Division	A. B. Garner		Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col.
Kentucky Central	G. H. Pendleton	Geo. P. Bowler	Covington, Ky.
Keokuk & Des Moines Valley	Geo H. Griggs	G. E Kilbourne	Keokuk, Iowa.

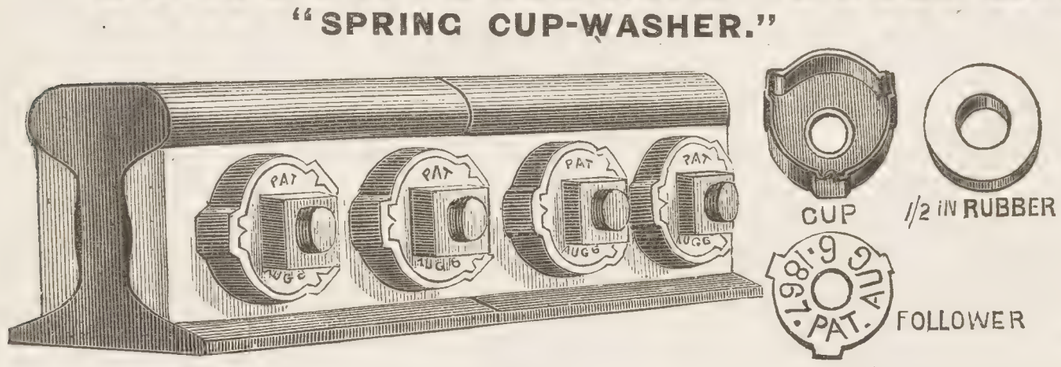
Railroad.	Superintendent.	Purchasing Agent.	Residence.
Knox & Lincoln	C. A. Coombs	Oliver Morse	Bath, Maine.
Lackawanna & Bloomsburg	D. T. Bound		Kingston, Pa.
Lackawanna & Bloomsburg		G.W. B. Cushing	New-York City.
Lake Erie & Louisville	I. H. Burgoon		Fremont, Ohio.
Lake Ontario Shore	George Bennett		Oswego, N. Y.
Lake Superior & Mississippi	G. H. Smith		St. Paul, Minn.
Lake Shore & Michigan Southern	Charles Paine	A. C. Armstrong	Cleveland, Ohio.
Kalamazoo Division	William Wheaton		Kalamazoo, Mich.
Detroit Division			
Lansing Division			
Leavenworth, Lawrence & Galveston	B. S. Henning	Allan Bourne	Lawrence, Kan.
Leavenworth, Lawrence & Galveston	*Geo. H. Nettleton		Kansas City, Mo.
Lawrence & South-Western	R. B. Gemmell	R. B. Gemmell	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
		L. Chamberlin	Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa
Mahony Division	James I. Blakslee		Mauch Chunk, Pa.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	T. Hartman		Little Rock, Ark.
Logansport, Crawfordsville & S. W.	F. N. Finney		Terre Haute, Ind.
Long Island	G. W. N. Custis	Oliver Charlick	Hunter's Point, L. I.
Louisville & Nashville & G. Southern	Albert Fink	G. C. Breed	Louisville, Ky.
Clarksville Division	Jas. Montgomery		Bowling Green, Ky.
Memphis Division	J. T. Flynn		Memphis, Tenn.
Nashville & Decatur Division	D. F. Whitcomb		Nashville, Tenn.
So. & North Ala. Division	Robert Meek		Birmingham, Ala.
Louisville, Cin. & Lexington	J. McLeod	Wm. Mahl	Louisville, Ky.
Louisville, New-Albany & Chicago	John L. Day	J. R. Parker	New-Albany, Ind.
Louisville, Paducah & Southwestern	D. F. Whitcomb	D. F. Whitcomb	Louisville, Ky.
M			
Macon & Brunswick	J. W. Gun		Macon, Ga.
Macon & Western	Capt. G. I. Foreacre		Atlanta, Ga.
Maine Central	L. L. Lincoln	G. A. Phillips	Augusta, Me.
Androscoggin Division	A. Brown		Lewiston, Me.
Manchester & Lawrence	H. E. Chamberlin		Concord, N. H.
Marietta & Cincinnati	W. W. Peabody	S. L. Campbell	Cincinnati, Ohio.
Marietta, Pittsburg & Cleveland	Jas. McArthur	R. B. Hoover	Marietta, Ohio.
Marquette, Houghton & Ontonagon	*Samuel Schoch	S. Schoch	Marquette, Mich.
Maryland & Delaware	J. L. Caldwell	J. L. Caldwell	Easton, Md.
Memphis, Carthage & North-Western	E. H. Brown		Carthage, Mo.
Memphis & Little Rock	T. S. Tate, Jr.	J. D. Darden	Memphis, Tenn.
Memphis & Charleston	W. J. Ross	J. B. Gallaway	Memphis, Tenn.
Michigan Central	W. B. Strong		Chicago. Ill.
Michigan Central	‡J. R. Ledyard	John Newell	Detroit, Mich.
Grand River Valley Division	C. B. Bush		Grand Rapids, Mich.
Jackson, Lansing & Saginaw Div.	C. B. Bush		Saginaw City, Mich.
Michigan Lake Shore	Chas. E. Gorham		Fort Wayne, Ind.
Michigan Lake Shore	P. S. O'Rourke		Monteith, Mich.
Midland Railway of Canada	H. G. Taylor		Port Hope, Ont.
Midland Pacific	J. N. Converse	M. A. Showers	Nebraska City, Neb.
Milwaukee, Lake Shore & Western	H. G. H. Reed		Milwaukee. Wis.
Western Division	J. S. Buck		Appleton, Wis.
Mineral Point	G. W. Cobb	G. W. Cobb	Mineral Point, Wis.
Mineral Range	J. H. Macdonald		Hancock, Mich
Mississippi & Tennessee	M. Burke	M. Burke	Memphis, Tenn.
Mississippi Valley & Western	Guy Wells		Quincy, Ill.
Missouri, Iowa & Nebraska	Col. Henry Hill		Warsaw, Ill.
Missouri, Kansas & Texas	C. H. Chappel		Sedalia, Mo.
Missouri, Kansas & Texas		G. M. Babcock	Sedalia, Mo.
Cherokee Division	L. H. Sheldon		Parsons, Kansas.
Choctaw Division	S. G. Eddy		Dennison, Texas.
Missouri Division	J. J. Frey		Sedalia, Mo.
Sedalia Division	J. J. Frey		Sedalia. Mo.
Neosho Division	L. H. Sheldon		Parsons, Kansas.
Osage Divsion	C. M. Sheafe		Holden, Mo.
Missouri Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Missouri River, Fort Scott & Gulf	B. S. Henning	Allan Bourn	Kansas City, Mo.
Missouri River, Fort Scott & Gulf	*Geo. H. Nettleton		Kansas City, Mo.
Mobile & Ohio	A. L. Rives	C. E. Rushing	Mobile, Ala.
Alabama Division	Cecil Fleming		Mobile, Ala.
Mississippi Division	E. S. Hosford		Macon, Miss.
Tenn. & Ky. Divis on	G. W. Robertson		Jackson, Tenn.
Mobile & Girard	W. L. Clark		Columbus, Ga.
Mobile & Montgomery	G. Jordon	G. Jordon	Montgomery, Ala.
Montgomery & Eufaula	B. Dunham	B. Dunham	Montgomery, Ala.
Morgan's Louisiana & Texas		C. A. Whitney & Co.	New-Orleans, La
N			
Nashville, Chattanooga & St. Louis	J. W. Thomas	L. P. Barnes	Nashville, Tenn.
Naugatuck	G. W. Beach		Bridgeport, Ct.
New-Brunswick & Canada		Tho. H. Street	St. Andrews, N. B.
New-Brunswick & Canada	John Stewart		St. Stephens, N. B.
New-Bedford & Taunton	Warren Ladd		New-Bedford, Mass.
New-Haven & Derby	E. S. Quintard		New-Haven, Ct.
New-Haven & Northampton	C. N. Yeamans	C. N. Yeamans	New-Haven, Ct.
New-Haven, Middletown & Willimantic	W. A. Waterbury	W. A. Waterbury	Middletown, Ct
New-Jersey & New-York	W. D. Beasley		Jersey City, N. J.
New-Jersey Midland	W. E. Lewis		Wortendyke, N. J.
New-Jersey Southern	*W. S. Sneden		Long Branch, N. J
New-Orleans & Selma	T. H. Du Puy		Selma, Ala.
New-Orleans, St. Louis & Chicago	*E. D. Frost	S. H. Edgar, V. P.	New-Orleans, La.
New-Orleans & Mobile	D. B. Robinson		Mobile, Ala.
New-York & Harlem	Chas. M. Bissell	R. C. Moore	New-York, N. Y.
New-York, New-Haven & Hartford	E. M. Reed	R. N. Dowd	New Haven, Ct.
N. Y. & N. H. Division	John T. Moody		New-York, N. Y.
Hartford Division	C. S. Davidson		Hartford, Ct.
Shore Line Division	W. H. Stephenson		New-Haven, Ct.
New-York, Boston & Montreal	C. L. Kimball		Dutchess Jn., N. Y
New-York Central & Hudson River	J. Tillinghast		Albany, N. Y.
New-York Central & Hudson River		C. V. DeForest	New-York.
Eastern Division	Zenas C. Priest		Utica, N. Y.
Syracuse & Rochester Division	G. H. Burrows		Syracuse, N. Y.
Buffalo & Rochester Division	M. W. Torrence		Buffalo, N. Y.
New-York & New-England	H. A. G. Pomeroy		Boston, Mass.
Worcester Division	P. St. M. Andrews		Worcester, Mass.
New-York & Oswego Midland			New-York, N. Y.
New-Jersey Division	G. W. N. Custis		Jersey City, N. J.
Middle Division	H. M. Flint		Middletown, N. Y.
Western Division			Oswego, N. Y.
New-York, King on & Syracuse	H. P. Breed		Rondout, N. Y.
New-York, Providence & Boston	A. S. Matthews	A. S. Matthews	Stonington, Ct.
New Brunswick	Tho. Hoben	W. R. Logan	Fredericton, N.B.
Northern Pacific	*C. W. Mead	E. F. Williams	St. Paul, Minn.
Minnesota Division	J. H. Sullivan		Brainerd, Minn.
Northern Pacific Division	*J. W. Sprague		Kalama, W. T.
Lake Superior & Miss. Division	George H. Smith		St. Paul, Minn.
North-Louisiana & Texas	W. R. Gordon		Monroe, La.
North-Pennsylvania	S. W. Roberts	F. A. Cornby	Philadelphia, Pa.
Northern Canada	†F. W. Cumberland		Toronto, Can.
Northern Central		Godfrey W. Rhodes	Baltimore, Md.
Northern Central	*Frank Thomson		Philadelphia, Pa.
Northern (New-Hampshire)	George E. Todd		Concord, N. H.
North-Eastern (South-Carolina)	F. K. Huger		Charleston, S. C.
O			
Ohio & Mississippi	E. L. Ryder		Cincinnati, Ohio.
Oil Creek & Alleghany River	C. J. Hepburn		Oil City, Pa.
Old Colony	J. R. Kendrick		Boston, Mass.
Omaha & North-Western	J. E. House		Omaha, Neb.
Oregon & California	J. Brandt, Jr.		Portland, Oregon.
P			
Paducah & Memphis	M. Burke		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Paris & Danville	B. F. Matthius		Danville, Ill.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
Pennsylvania	G. Clinton Gardner		Altoona, Pa.
Pennsylvania	*Frank Thomson	Enoch Lewis	Philadelphia, Pa.
Philadelphia Division	W. F. Lockard		Philadelphia, Pa.
Middle Division	J. N. McCrea		Harrisburg, Pa.
Pittsburg Division	Rob't Pitcairn		Pittsburg, Pa.
Tyrone Division	S. S. Blair		Tyrone Pa.
Bedford Division	S. M. Prevost		Bedford, Pa.
West Pennsylvania Division	J. McCreighton		Allegheny City, Pa.
Pennsylvania & New-York Canal	A. Mitchell		Wilkesbarre, Pa.
Pensacola & Louisville	C. S. Williams		Pensacola, Fla.
Peoria & Rock Island	John R. Hilliard		Peoria, Ill.
Peoria & Rock Island	*W. R. Hamilton	W. R. Hamilton	Peoria, Ill.
Peoria, Pekin & Jacksonville	James F. Kelsey	John Allen	Pekin, Ill.
Petersburg	R. A. Bacon	W. P. Taylor	Petersburg, Va.
Philadelphia & Reading	J. E. Wootten	W. S. Wilson	Reading, Pa.
Catawissa & Williamsport Br'ch	George Webb		Pittsburg, Pa.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Lebanon & Tremont	H. W. Tracy		Pine Grove, Pa.
Philadelphia and Baltimore Central	Henry Wood	Henry Wood	Philadelphia, Pa.
Philadelphia & Erie	W. A. Baldwin		Williamsport, Pa.
Philadelphia & Erie		Enoch Lewis	Philadelphia, Pa.
Western Division	J. W. Reynolds		Erie, Pa.
Middle Division	Edmund L. Tyler		Renovo, Pa.
Eastern Division	Thomas Gucker		Williamsport, Pa.
Philadelphia, Wilmington & Baltimore	H. F. Kenney		Philadelphia, Pa.
Pithole Valley	J. T. Odell		Pithole City, Pa.
Pittsburg, Cincinnati & St. Louis	S. M. Felton, Jr.	Wm. Mullins	Pittsburg, Pa.
Pittsburg & Cin. Division	S. M. Felton, Jr		Pittsburg, Pa.
Little Miami Division	J. D. Ellison		Cincinnati, Ohio.
Indianapolis & C. Division	D. W. Caldwell		Columbus, Ohio.
Pittsburg, Washington & Baltimore	E. K. Hindman		Connellsville, Pa.
Pittsburg, Ft. Wayne & Chicago	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Eastern Division	George Webb		Pittsburg, Pa.
Western Division	C. D. Gorham		Fort Wayne, Ind.
Port Royal	R. G. Fleming		Augusta, Ga.
Portland & Ogdensburg	J. Hamilton	John E. Donnell	Portland, Maine.
Portland & Rochester	W. H. Turner	W. H. Turner	Portland, Maine.
Portland, Saco & Portsmouth	Francis Chase		Portland, Maine.
Portsmouth, Great Falls & Conway	J. W. Sanborn		Portsmouth, N. H.
Portsmouth	H. E. Chamberlin		Concord, N. H.
Poughkeepsie & Eastern	J. A. Perkins	A. W. Cable	Poughkeepsie, N.Y
Providence & Worcester	W. D. Hilton	W. D. Hilton	Providence, R. I.
Providence, Warren & B	Waterman Stone		Providence, R. I.
Q			
Quincy, Alton & St. Louis	N. J. T. Dana	N. J. T. Dana	Quincy, Ill.
Quincy, Missouri & Pacific	J. R. Buchanan		Quincy, Ill.
R			
Raleigh & Gaston	A. B. Andrews	A. B. Andrews	Raleigh, N. C.
Rensselaer & Saratoga	S. R. Voorhees		Albany, N. Y.
Richmond, York River & Chesapeake	E. F. Folger	Hugh Graham	Richmond, Va.
Richmond & Danville	T. M. R. Talcott		Richmond, Va.
Richmond, Fred. & Potomac	E. T. D. Myers	T. L. Courtney	Richmond, Va.
Richmond & Petersburg	Augustus Shaw		Richmond, Va.
Rockford, Rock Island & St. Louis	W. H. Ferry, Receiver		Rock Island, Ill.
Northern Division	Henry Looseley		Rock Island, Ill.
Southern Division	Geo. L. Walker		Beardstown, Ill.
Rome, Watertown & Ogdensburg	J. W. Moak		Watertown, N. Y.
S			
St. Lawrence & Ottawa	R. Luttreil		Prescott, Can.
St. Joseph & Denver City	*L. D. Tuthill		St. Joseph, Mo.
St. Paul & Pacific	E. Q. Sewell	E. C. Becker	St. Paul, Minn.
St. Paul & Sioux City	J. F. Lincoln	J. F. Lincoln	St. Paul, Minn.
St. Louis, Alton & Terre Haute	W. G. Broughton		St Louis, Mo.
St. Louis, Iron Mountain & Southern	Arthur W. Soper	W. S. Cuddy	St. Louis, Mo.
St. Louis, Iron Mountain & Southern	*Tho. McKissock		St. Louis, Mo.
St. Louis & South-Eastern	*E. F. Winslow	C. O. Wood	St. Louis, Mo.
St. Louis Division	George S. Winslow		Mt. Vernon, Ill.
Nashville Division	R. H. G. Minty		Nashville, Tenn.
St. Louis, Kansas City & Northern	W. R. Arthur	R. W. Green	St. Louis, Mo.
St Louis Division	W. H. Vaughan		St. Louis, Mo.
Western Division	C. L. Dunham		Kansas City, Mo.
St. Louis, Vandalia, Terre Haute & Ind.	John E. Simpson		Indianapolis, Ind.
St. Louis, Vandalia, Terre Haute & Ind.	Chas. R. Peddle		Terre Haute, Ind.
St. Louis, Lawrence & Western	E. C. Devereaux		Lawrence, Kan.
St. Louis, Salem & Little Rock	J. W. Blanchard	H. A. Crawford	St. Louis, Mo.
Sacramento Valley & P. & S. V.	F. A. Bishop		Sacramento, Cal.
Saginaw Valley & St. Louis	N. M. Merrill.	N. M. Merrill.	Saginaw, Mich.
San Francisco & Northern Pacific	A. A. Bean	F. H. Gudes	Petaluma Cal.
San Rafael & San Quentin	David Nye		San Rafael, Cal.
Savannah & Charleston	C. S. Gadsden		Charleston, S. C.
Seaboard & Roanoke		E. G. Ghio	Baltimore, Md.
Selma, Marion & Memphis	E. W. Rucker	E. W. Rucker	Marion, Ala.
Selma, Rome & Dalton	M. Stanton		Selma, Ala.
Sheboygan & Fond du Lac	L. A. Emerson	L. A. Emerson	Fond du Lac, Wis
Shenango & Allegheny	A. L. Dunbar		Meadville, Pa.
Sioux City & Pacific	L. Burnett	L. Burnett	Missouri Valley, Ia.
Sodus Point & Southern	H. Van Vleck		Sodus Point, N. Y.
South-Shore	J. R. Kendrick		Boston, Mass.
South Carolina	S. S. Solomon	A. Mitchell	Charleston, S. C.
Southern Central	Jas. G. Knapp		Auburn, N. Y.
Southern, of Long Island	I. D. Barton		Hunter's Point, L. I
Southern, of Long Island		A. E. Godeffroy	New-York City.
Southern Minnesota	W. C. Van Horne		Wells, Minn.
Southern Pacific of California	A. N. Towne		Sacramento, Cal.
Southwestern of Georgia	Virgil Powers		Macon, Ga.
Spartanburg & Union	W. W. Davies		Spartanburg, S. C.
Springfield Athol & Northeastern	John W. Phelps		Springfield, Mass.
Springfield & North-Western	*A. J. Ware		Pekin, Ill.
Staten Island	J. W. Wilbur		New-York, N. Y.
Stockton & Ione	W. G. Miller		Stockton, Cal.
Stonington & Providence	A. S. Mathews	A. S. Mathews	Stonington, Ct.
Sullivan & Erie	Wm. Stevenson		Towanda, Pa.
Summit County	W. M. Riter		Coalville, Utah.
Syracuse Northern	J. W. Moak		Watertown, N. Y
Syracuse, Binghamton & New-York	T. Voorhees	G. W. B. Cushing	Syracuse, N. Y.
T			
Tennessee & Pacific	George Maney		Nashville, Tenn.
Terre Haute & Indianapolis	J. E. Simpson		Indianapolis, Ind.
Terre Haute & Indianapolis		C. R. Peddle	Terre Haute, Ind.
Texas & New-Orleans	R B. Baer		Houston, Texas.
Texas & Pacific	Geo. H. Noble		Marshall, Texas
Tioga	L. H. Shattuck		Blossburg, Pa.
Toledo, Peoria and Warsaw	W. H. Cruger		Peoria, Ill.
Toledo, Peoria & Warsaw		Oran Ott	Chicago, Ill.
Western Division	David K. Smith		Peoria, Ill.
Western Division	William E. Dorwin		Warsaw, Ill.
Toledo, Wabash & Western	Robert Andrews	J. T. Sterling	Toledo, Ohio.
Eastern Division	K. H. Wade		Lafayette, Ind.
Western Division	C. W. Bradley		Springfield, Ill.
Toledo, Canada Southern & Detroit	D. Edwards		Toledo, Ohio.
Troy & Boston	C. W. Moseley		Troy, N. Y.
Toronto, Grey & Bruce	N. Weatherston	W. Watson	Toronto, Can.
Toronto & Nipissing	J. C. Bailey		Toronto.
Tuckerton	J. Naramore		Tuckerton, N. J.
U			
Union Pacific	S. H. H. Clarke	S. H. H. Clarke	Omaha, Neb.
Mountain Division	S. J. Nichols		Cheyenne, Wyom'g
Laramie Division	S. T. Shankland		Laramie, Wyoming
Western Division	O. H. Earll		Evanston, Wyoming
Utah Central & Southern	John Sharp	S. H. Hill	Salt Lake City.
Utica & Black River	J. F. Maynard		Utica, N. Y.
Utica, Ithaca, & Elmira	H. P. Goodrich		Ithaca, N. Y.

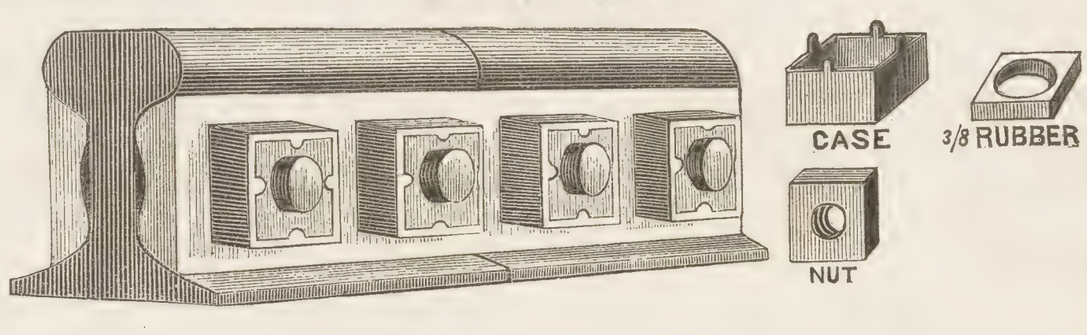
Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
V			
Vermont & Mass. & Troy & G	O. T. Ruggles	O. T. Ruggles	Fitchburg, Mass.
Vermont Central	J. W. Hobart		St. Albans, Vt.
Western Division	John Schrier		Ogdensburg, N. Y.
Central & Southern Division	Ambrose Arnold		St. Albans, Vt.
Northern & Eastern Division	G. L. Stone	" " "	
Rutland Division	J. Burdett		Rutland, Vt.
Harlem Extension Division	J. Burdett		Rutland, Vt.
New-London Northern	G. W. Bentley		New-London, Ct.
Vicksburg & Meridian	E. F. Raworth		Vicksburg, Miss.
Virginia & Truckee	C. M. Yerrington	C. P. Mason	Carson, Nevada.
W			
Washington & Ohio	R. H. Havener	Lewis McKenzie	Alexandria, Va.
Welland	William Pay		St. Catherine, Ont.
Westchester & Philadelphia	Henry K. Smith	J. J. Bryant	Philadelphia, Pa.
West-Wisconsin	W. G. Swan		Hudson, Wis.
West-Jersey	W. J. Sewell	Enoch Lewis	Camden, N. J.
Western of North-Carolina	John M. Rose		Fayetteville, N. C.
Western & Atlantic	Wm. McRae		Atlanta, Ga.
Western Maryland	*J. M. Hood		Baltimore, Md.
Western Union	D. A. Olin		Racine, Wis.
White Water Valley	H. M. Britton	H. M. Britton	Cincinnati, Ohio.
Wilmington & Western	David Conneli		Wilmington, Del.
Wilmington, Columbia & Augusta	James Anderson	James Anderson	Wilmington, N. C.
Wilmington & Weldon	J. F. Devine		Atlanta, Ga.
Wilmington & Reading	E. Collings	C. Stoltz	Coatesville, Pa.
Winona & St. Peter	S. Sanborn		Madison, Wis.
Winona & St. Peter		R. W. Hamer	Chicago, Ill.
Wisconsin Central	E. B. Phillips		Milwaukee, Wis.
Worcester & Nashua	C. S. Turner	C. S. Turner	Worcester, Mass.

PRATT'S PATENT COMPENSATING FISH-PLATE JOINTS.

"SPRING CUP-WASHER."



"SPRING NUT."



Track Bolts and Nuts are constantly subjected to a vibration and jar. One large item of expense is for wrench-work and replacement of bolts and nuts already off.

Most of the contrivances for removing this trouble are failures. They do not remove the cause of the trouble. This can only be done by some elastic material, which will absorb the vibration and prevent its reaching the nuts. Experience proves that permanent elasticity can not be obtained by using wood, which is perishable, or steel, which can not be made of uniform temper. In our inventions, the elastic packing of rubber between the nut and the plate absorbs the jar or vibration, insulates the nut, and by removing the cause of the trouble removes the trouble itself. Among its advantages are these:

1st. It saves the expense of wrench-work and loss of nuts.

2d. The rubber absorbs the blow given by the wheels at the joint, in such manner as to prevent fracture of rails at the joint, and accidents resulting therefrom.

3d. The track is made noiseless.

4th. Rails are saved from pounding out at the ends, and the thread of the bolts and nuts from stripping.

The practical value of these inventions is more fully demonstrated by the two million joints now long in use.

Manufactured and Sold by

THE PRATT MANUFACTURING COMPANY,

NO. 71 BROADWAY, NEW-YORK,

Manufacturers and Dealers in all kinds of RAILWAY TRACK SUPPLIES; also, New-York Agents for the Tuttle & Whittemore Co., Naugatuck Conn., Manufacturers of REFINED MALLEABLE IRON CASTINGS, from Patterns to order.

Special attention given to MALLEABLE IRON CASTINGS for Railroad Car construction.

JOS. W. SPRAGUE, Pres't and Sup't. **W. CRICHTON, Jr., Sec'y and Treas.**



MANUFACTURERS OF

PASSENGER AND FREIGHT CARS.

Car Wheels and Car Castings and Forgings.

VOSE, DINSMORE & CO.,

Importers, Manufacturers, and Dealers in

Railway and Steamship

SUPPLIES

Of all Kinds.

CAR PLUSHES

AND

UPHOLSTERY GOODS, HEAD LININGS, ETC.

Bronze and other Trimmings of the Latest Patterns constantly in Stock.

LOCOMOTIVE HEAD LIGHTS AND STEAM GAUGES,

CAR SPRINGS OF EVERY DESCRIPTION,

INCLUDING THE "COMBINATION ELLIPTIC SPRING."

Special attention is called to our Patent **CLIFF ELLIPTIC SPRINGS** for Freight and Passenger service. See advertisement, page ii.

Steel Rails, Locomotive and Car Tires, Elliptic Springs and Cast Steel of all descriptions.

JOHN C. WYMAN, General Manager.

52 Fifth Avenue, Chicago.

720 North Second Street, St. Louis.

32 Warren St.,

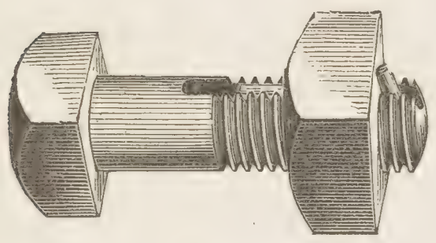
NEW-YORK.

Wm. Courtenay, President. Chas. F. Cobb, Secretary.

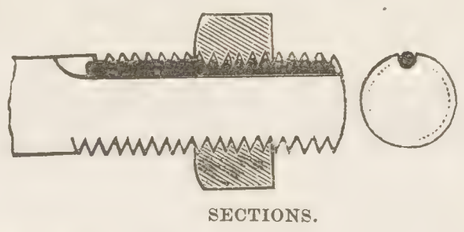
The Lock-Nut and Bolt Co., of New-York,

Office, No. 17 DEY STREET, New-York.

Manufacturers of all kinds of BOLTS, for FISH-PLATES, CARS, BRIDGES, MACHINERY, CARRIAGES, &c., with the



"Cumming Nut-lock,"
Patented
June 16, 1868,
August 23, 1870.



SECTIONS.

Unequaled for CHEAPNESS, SIMPLICITY & EFFECTIVENESS.

This simple device, as will be seen by the engravings, consists of a groove being cut in the threaded part of a screw bolt into which is placed a key of copper wire, or other soft metal; when the nut is screwed on, it cuts a thread on the key, thereby making it impossible for the key to get out until the nut is taken off. When the nut is screwed up to its place, that part of the key over which the nut has passed is riveted up against the nut with a small punch, destroying the thread on the key. The nut, therefore, can not move backward until force is used, as with a wrench.

The groove can be rapidly cut with a simple machine designed for the purpose.

Experience has proved this device absolutely reliable, and it is the cheapest of all known devices for the purpose. By its use, old bolts on which the nuts have become too slack for use can be made as good as new, making it a great saving to railroad companies and others in that item alone. It is cheaper than a check-nut.

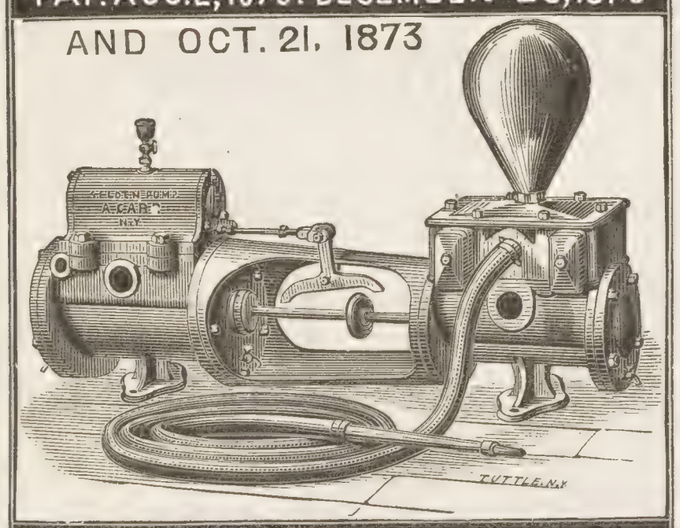
If the bolt should become slack from shrinking of timber or other causes, *the nut will always remain firmly attached to the bolt*, and, with the wrench, can be screwed up *any distance*, and the wire riveted up any number of times, or can be taken off without injury to the nut or bolt.

This is the only method in use that locks the nut firmly to the bolt without regard to place or surroundings, all others require some attachment that holds the bolt in its position, and a washer or other attachment to keep the nut from turning.

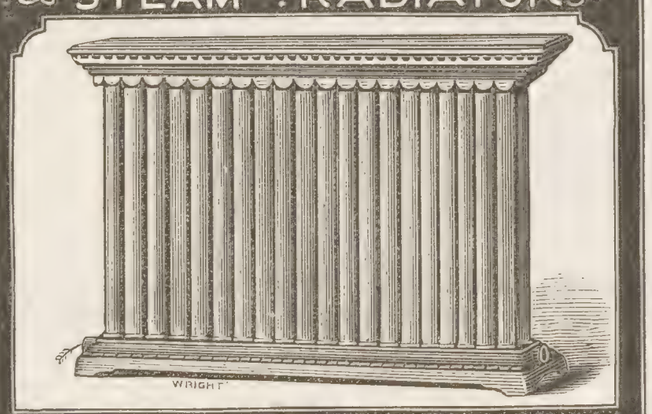
Directions for Use.—Place the copper key in the slot, pointed end out, and beveled side up, in such a position that when the nut is screwed to its place about three-eighths of an inch of the key will project beyond its outer face. Then screw the nut to its place *over the key*, allowing it to cut its own thread in the copper. Then take a narrow flat set punch, and rivet the projecting part of the key *solidly* against the outer face of the nut. To tighten the nut: screw it up, and rivet the key tighter. To remove the nut: simply apply the wrench and unscrew the nut. It will cut its own way out through the copper. The same key can be used several times, by moving it outward a few threads in the slot.

"DEAD STROKE" POWER HAMMER.
IMPROVED ADJUSTABLE CRANK PIN.
Strikes Blow Heavy or Light, Fast or Slow.
Prices Reduced Jan. 1st, 1875.
The Hull & Belden Company, Danbury, Ct.

THE SELDEN DIRECT-ACTING
STEAM-PUMP
PAT. AUG. 2, 1870. DECEMBER 20, 1870
AND OCT. 21, 1873

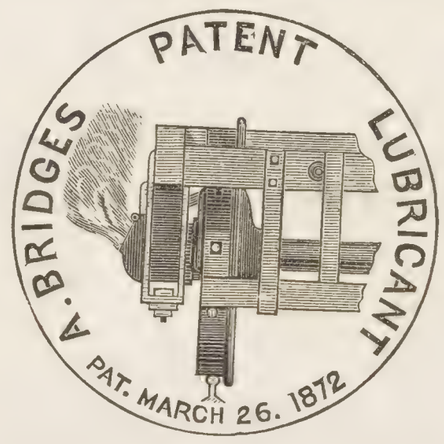


COMBINING SIMPLICITY AND DURABILITY TO A REMARKABLE DEGREE. IT'S PARTS ARE EASY OF ACCESS AND IT IS ADAPTED TO ALL PURPOSES FOR WHICH STEAM PUMPS ARE USED
A. CARR
MANUFACTURER AND PROPRIETOR,
43 CORTLANDT ST. NEW YORK.
CARR'S POSITIVE CIRCULATING
STEAM RADIATOR



THE ONLY UPRIGHT STEAM RADIATOR MADE WHICH HAS A POSITIVE CIRCULATION.
ALSO
WROUGHT IRON PIPE, BRASS AND CAST WORK &c.,
FOR
PLUMBERS, STEAM AND GAS FITTERS.
SEND FOR DESCRIPTIVE CIRCULAR AND PRICE LISTS.

HOT JOURNALS ENTIRELY PREVENTED
BY THE USE OF



For Railroad Car Journals and other Bearings.

In presenting this Lubricant to the notice of Railroad and Steamboat Managers and Operators in Machinery generally, I do so with a practical knowledge of its merits, and with confidence that it will be found to possess invaluable qualities as a

Lubricator and Counteractor of Friction.

It has been in use, during the past two years, on a number of Railroads and Steamers, and is highly approved of.

Parties wishing to make a practical test of the Lubricant will be furnished with sample on application.

ALBERT BRIDGES, Patentee,

MANUFACTURER AND DEALER IN

RAILWAY SUPPLIES and MACHINERY,

No. 46 CORTLANDT STREET,

SEND FOR CIRCULAR. NEW-YORK.

HARRISBURG FOUNDRY

AND

Machine Company,

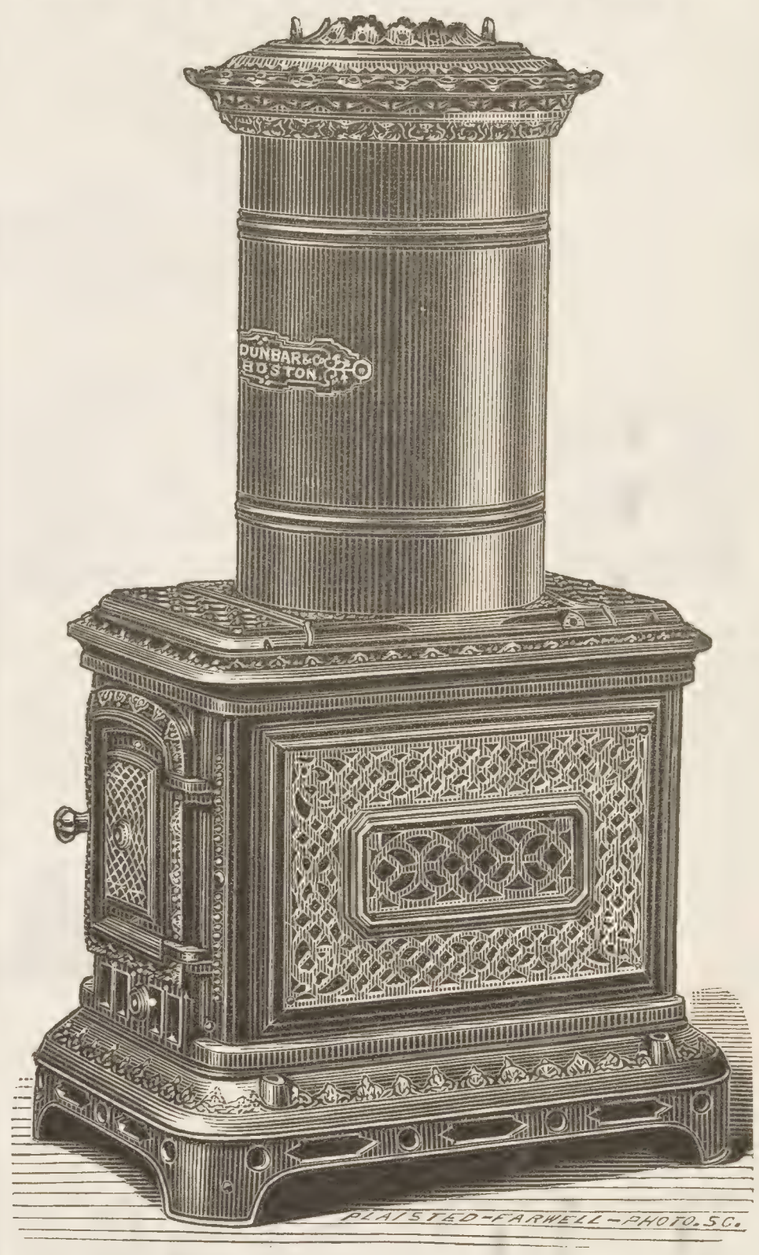
HARRISBURG, PA.

Manufacture all kinds of Machinists' and Car-Builders' Tools, for working Iron, such as Lathes, Planers, Slotting Machines, Horizontal Drilling and Boring Machines, Vertical Drills, all sizes, Shaping Machines, Bolt Cutters, Nut Tappers, Car Wheel Borers, Hydraulic Wheel Press, Axle Lathes, etc. Patent Sectional Tubular Boiler, safety and great economy at moderate cost.

Also Oil Tank Cars, Boiler and Sheet Iron work of all kinds, Foundry Cupolas, Cranes, Ladles, etc.

SAMUEL FISK, General Manager.

GEO. DUNBAR & CO.'S
Railway-Car Stove.



The above cut represents our new Railway Wood-Burning Car Stove, which for Style and Economy is unsurpassed by any in the market.

GEO. DUNBAR & CO.

Dealers in

General Railroad Supplies,

19 FEDERAL ST., BOSTON.

General Selling Agents for Boston Car-Spring Co. and Chrome Steel Co

THE UNION WHITE LEAD MANUFACTURING COMPANY. PURE

Union White Lead Manufacturing Co.,

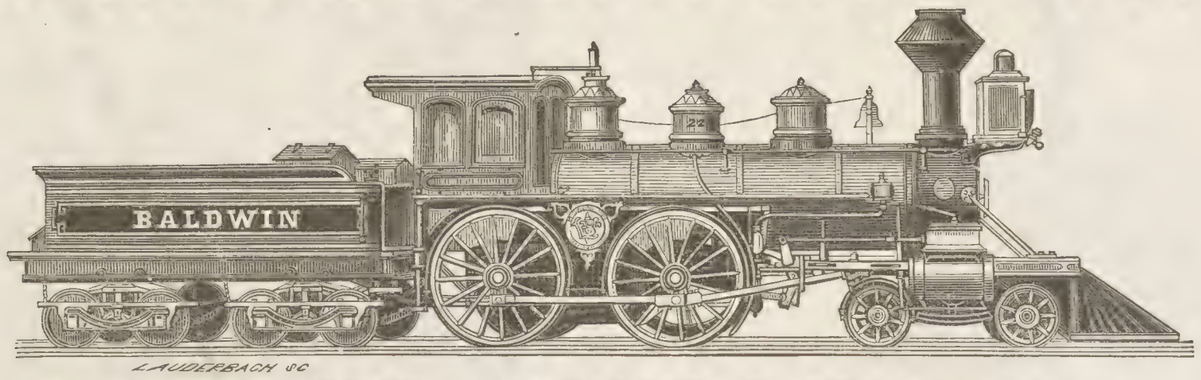
26 Burling Slip, New-York.

B. W. HOW, Secretary. JAMES HOW, President.

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WHITE LEAD, RED LEAD, LITHARGE, ORANGE MINERAL.

BALDWIN LOCOMOTIVE WORKS.



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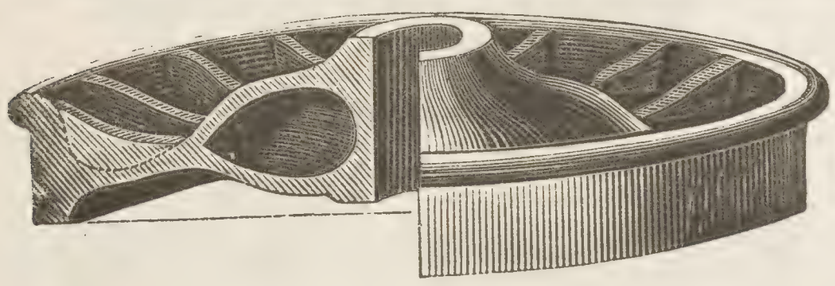
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LOCOMOTIVE ENGINES,

Especially adapted to every variety of Railroad use, including **Mine Engines and Locomotives for Narrow-Gauge Railways.**

All Work thoroughly interchangeable.

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Manufacturing Company,

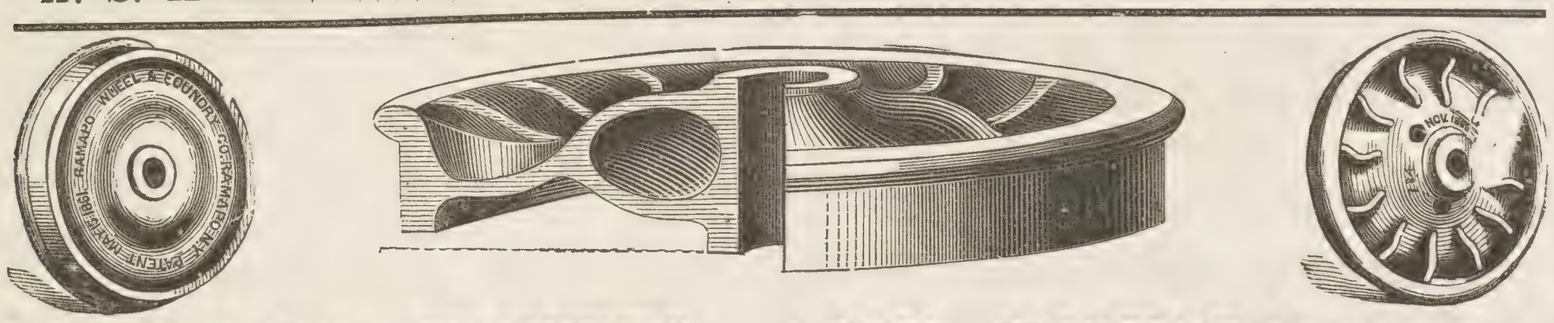
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BUILDERS OF

RAILWAY CARS OF ALL DESCRIPTIONS,

CAR WHEELS AND RAILWAY CASTINGS.

H. S. HYDE, Treasurer. G. C. FISK, President.



RAMAPO WHEEL AND FOUNDRY CO.,

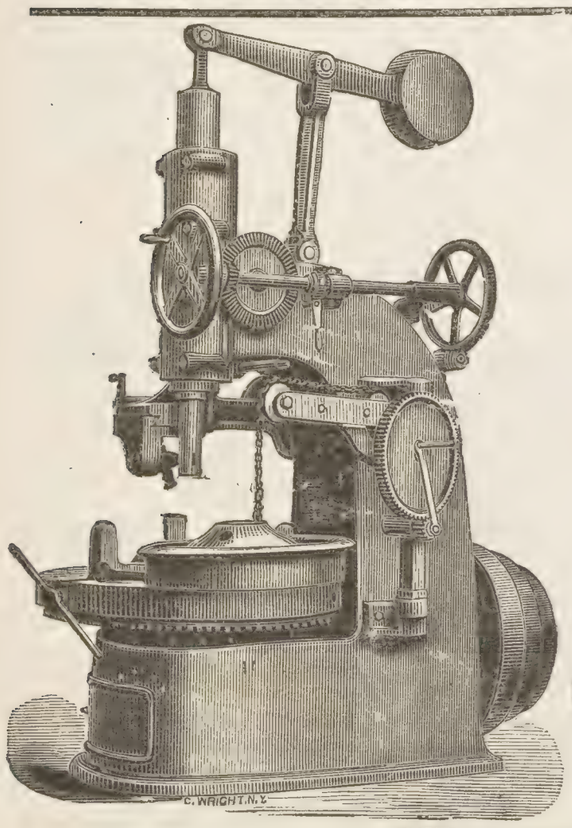
MANUFACTURERS OF

Chilled Wheels for Drawing-Room and Sleeping Coaches,

LOCOMOTIVES, TENDERS, PASSENGER AND FREIGHT CARS.

GEO. CHURCH, Pres't and Treasurer. **W. W. SNOW, Sup't and Gen'l Manager.**

RAMAPO, ROCKLAND COUNTY, N. Y.



NEW-YORK STEAM ENGINE Co.
MANUFACTURERS OF
MACHINISTS' TOOLS
OF ALL DESCRIPTIONS
CHAS. A. CHEEVER, TREAS. No. 98 CHAMBERS ST
GEO. Q. DOW, SEC'Y. NEW-YORK

WE HAVE THE BEST AND MOST COMPLETE ASSORTMENT OF

MACHINISTS' TOOLS

IN THE COUNTRY, COMPRISING ALL THOSE USED IN

MACHINE, LOCOMOTIVE, AND CAR SHOPS.

WE MAKE A SPECIALTY OF MANUFACTURING

GEAR WHEELS OF ALL DESCRIPTIONS,

WHICH ARE MADE ABSOLUTELY PERFECT WITH OUR

PATENT MOULDING MACHINE.

FOR PHOTOGRAPHS, PRICES, AND DESCRIPTION, ADDRESS

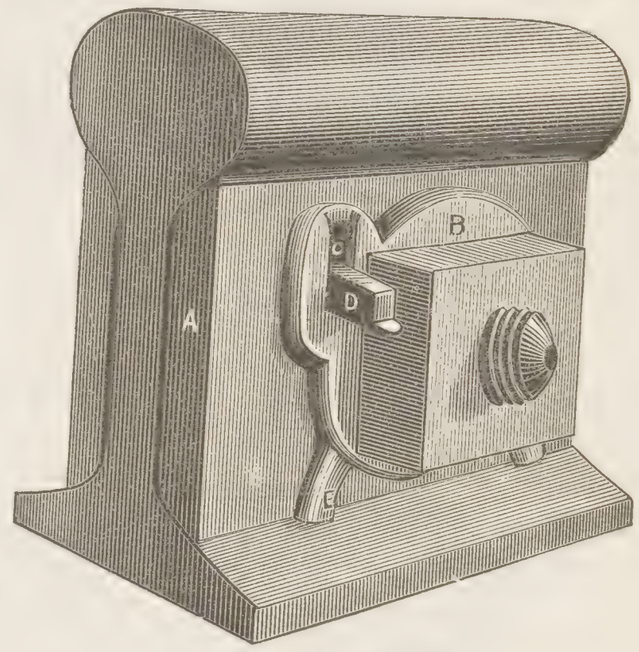
NEW-YORK STEAM ENGINE CO.,

98 CHAMBERS STREET, NEW-YORK.

PURDIE'S PATENT

Safety Washer,

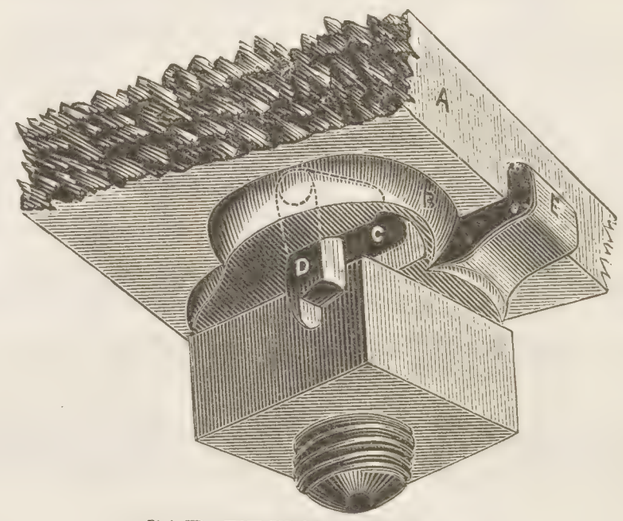
A Positive Nut-Lock, made of Malleable Iron.



For FISH PLATE.

EXPLANATION OF CUT.

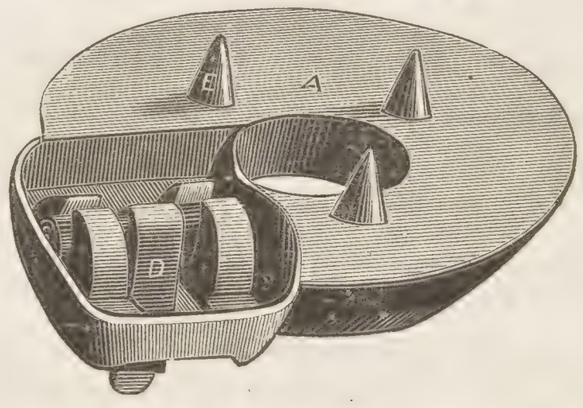
A, Fish plate. *B*, Washer, with projecting feet. *C*, Cavity into which the dog, *D*, swings, on screwing up the nut. *D*, Pivoted dog which falls by side of nut when screwed home.



CAR TRUCK Washer.

Adapted for use on fish-plate bolts, car trucks, wagons, mowing machines, wood-work of all kinds, or for any purpose where bolts and nuts are used.

Cheap, Effective, and Durable.



Reverse side for WOOD-WORK, showing Method of Pivot-Swing.

Will fit on old or new work, no alterations or special tools needed, requiring no rubber or wood for compressing or bending to hold the nut. The dog being in position to lock at any time required, by turning down by the side of the nut when screwed home; should the bolt or thread give any, so as to become loose, the dog will still hold the nut from turning back, and the nut can be screwed up as readily as by the old method.

Have been practically tested for two and a half years on many Railroads, giving unqualified satisfaction, one Railroad alone having them on over 2,500 cars.

Cast-iron washers for timber or bridges furnished to any size or weight.

Samples and price-lists forwarded on application to

JOHN PURDIE,

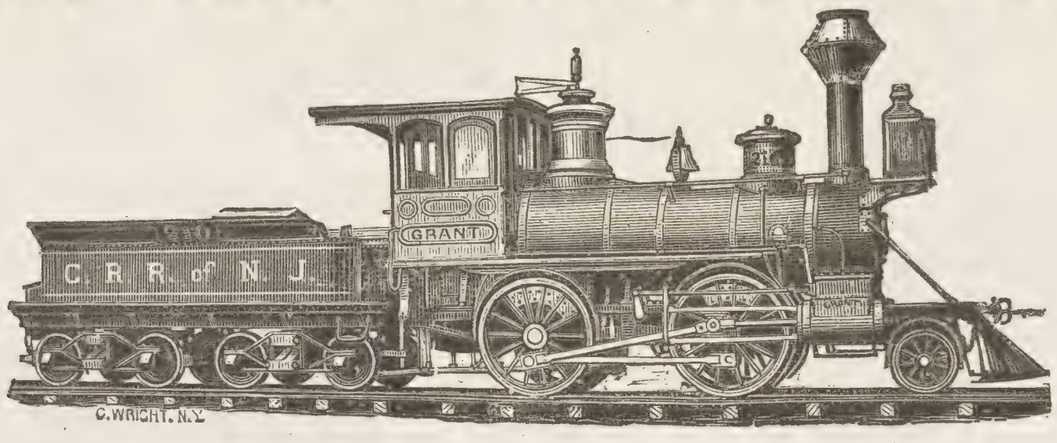
MANAGER OF

Safety Washer Manufacturing Company,

No. 311 MAIN STREET,

BUFFALO, N. Y.

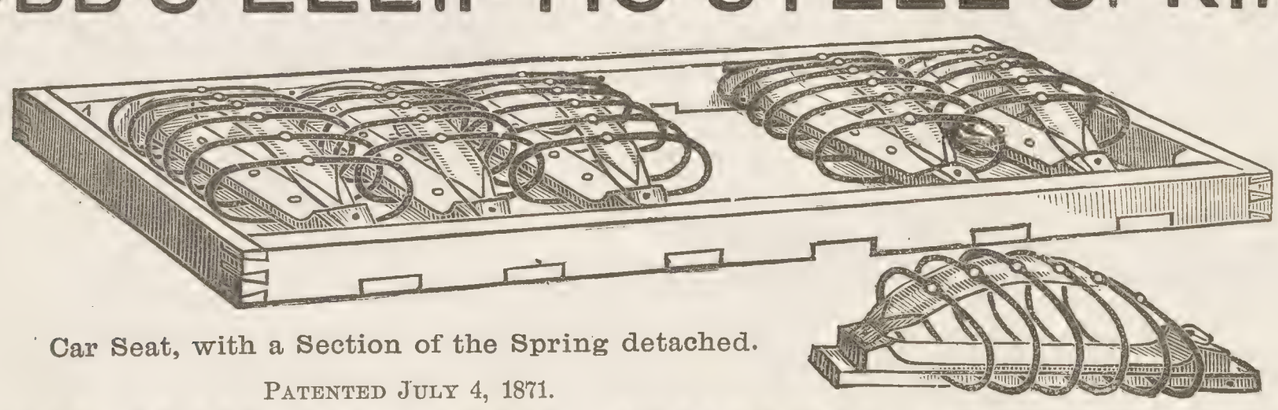
GRANT LOCOMOTIVE WORKS.



PATERSON, NEW-JERSEY.

NEW-YORK OFFICE: 33 WALL STREET.

COBB'S ELLIPTIC STEEL SPRING.



Car Seat, with a Section of the Spring detached.

PATENTED JULY 4, 1871.

FOR CAR SEATS AND SPRING MATTRESSES FOR SLEEPING CARS.

These Springs have been in successful operation on a large number of the leading railroads in the United States for over three years.

OFFICE OF PULLMAN PALACE CAR COMPANY,
CHICAGO, January 1, 1873.

Z. COBB & SONS, CHICAGO, ILL.:
GENTS: Have used your Patent Elliptic Steel Spring *exclusively* for the last three years in over **300** of our cars, and are satisfied of their superiority over all other springs in use.

A. B. PULLMAN.

Z. COBB & SONS, 292 West Adams Street, CHICAGO.

BRANCH OFFICE: Wilmington, Del.

NEW-HAVEN CAR HEAD-LINING WORKS,

NEW-HAVEN, CONN.

In consequence of the large and increased demand for our "CAR HEAD LININGS" we have been obliged to remove our Manufactory from WORCESTER, MASS., to NEW-HAVEN CONN., where new and commodious buildings have been erected, with increased conveniences for promptly supplying our customers, and we beg to invite your attention to our new and SUPERIOR FACILITIES for furnishing

"CAR HEAD LININGS"

OF THE MOST APPROVED STYLES AND PATTERNS

Either Full Decorated, Part Decorated, Encaustic, or Printed and Plain,

At Short Notice and in the Most Satisfactory Manner.

Orders will be received at the Factory, in New-Haven, Ct., or by

L. C. TILLOTSON & CO.,

No. 8 Dey Street, New-York,

MANUFACTURERS AND DEALERS IN RAILWAY AND TELEGRAPH SUPPLIES OF EVERY DESCRIPTION.

F. J. LAWRENCE,

MANUFACTURER OF

Railroad Car Head Linings,

15 Hamilton Street,

ALBANY, N. Y.

Particular attention paid to Drawing-Room and Sleeping Car Linings.

Refers to Hon. W. WAGNER, Esq., Pres't of Sleeping Car Co.

Jas. M. Blanchard. W. R. Singleton.
Late Holloway, Mason & Blanchard.

BLANCHARD & SINGLETON,

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Foreign and American Patents,

PROSECUTE UNITED STATES LAND CLAIMS,

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PLANING AND MATCHING

MACHINES

UNIVERSAL WOOD WORKERS

TRADE MARK

WOOD WORKING MACHINERY.

BENTEL, MARGEDANT & CO.

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Send for Catalogue and Price List.

CRANK PLANERS.

Superior Design and Workmanship, Extra Heavy (1400 lb.)

DOWN, ANGULAR & CROSS-FEED,

TO PLANE 12x16x15.

The Hull & Belden Company, Danbury, Ct.

IRON AND STEEL

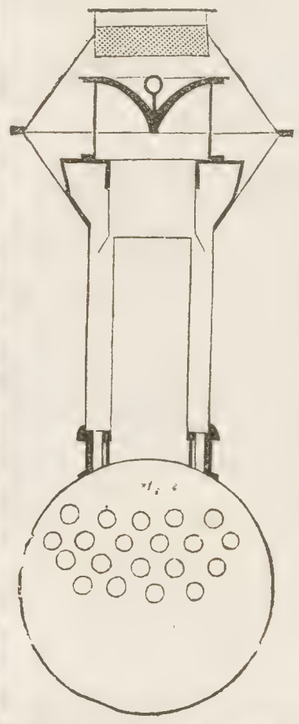
DROP FORGING.

Of Every Description, at Reasonable Prices.

The Hull & Belden Company, Danbury, Ct.

ANTHONY ROSS & JAMES McINTOSH'S

SPARK-CONSUMING SMOKE-STACK,



For Coal and Wood Burning Locomotives.

Patented June 23, 1874.

MEMPHIS, TENN.

We are now prepared to lay before the Railroad public a Smoke-Stack, which has been used for twelve months on the Memphis and Charleston Railroad, on Passenger, Freight, and Switching Engines, carrying the most combustible article—Cotton—without any danger of Fire whatever from sparks, or annoyance to passengers.

Railroad Companies wishing to use them can be furnished with working drawings by sending size of cylinder of engines to be used upon.

For rights to use the same and full particulars, apply to

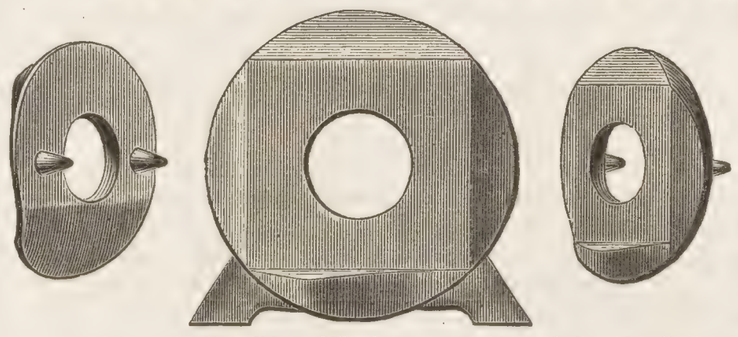
ANTHONY ROSS,

Master Mechanic,

Memphis and Charleston Railroad,

MEMPHIS, TENN.

KEEN'S PATENT ROCKING NUT-LOCK WASHER.



The only absolutely Perfect Nut-Lock in the market, combining Economy, Simplicity, and Perfect Safety.

The large cut represents the Fish-Plate Washer; the small one on the right is adapted to wood, a bottom view of which is shown in the left-hand cut with beveled side, and the spurs which penetrate the wood. They are in use on a number of Railroads, and give entire satisfaction, supplying the place of Jam-nut and Washer on wood, besides being cheaper and decidedly better. On Fish-Plates, the cost is about the same as that of the Jam-nut.

In ordering Fish-Plate Washers, specify height of rail and square of nut. In all other cases use M. C. B.'s standard size nut, flat side next the washer.

⅝ inch Nut, - - 1⅛ inch square.	⅞ inch Nut, - - 1⅝ inch square.
¾ " " - - 1⅜ " "	1 " " - - 1⅞ " "

VOSE, DINSMORE & CO., *Agents,* **GEO. W. KEEN & CO.,** *Proprietors,*

32 Warren St., New-York. ***22 NASSAU ST., NEW-YORK.***

Jersey City Steel Works.

JAMES R. THOMPSON & CO.,

MANUFACTURERS OF

HAMMERED AND ROLLED

CAST STEEL,

OF ALL DESCRIPTIONS,

Warren Street, Jersey City, N. J.

Tool, Drill, Frog Plates and Points, Cutlery, Rake, Axe, Hoe, Machinery, Spring, Wagon-Axle, Tire, Sword, Bayonet, Rifle, and Pistol, MADE TO ORDER.

JAS. R. THOMPSON, B. ILLINGSWORTH,
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BRONZE, NICKEL AND SILVER

Car Trimmings,

No. 64 FIFTH STREET,

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THE ROCKY MOUNTAIN VERMILION PAINT

Is "Nature's Compound" of COPPER, MERCURY, LEAD, and IRON.

A PURE OXIDE OF METALS, CONTAINING NO EARTHY MATTER.

Hence we claim and are prepared to *prove* that it is the

Best and Cheapest Paint in the Market.

Properly mixed, we will guarantee it to Cover Double the Surface and wear twice as long as ordinary paints. It will not *Peel*, *Scale*, *Crack*, or BLISTER, though subjected to high degrees of heat. It will effectually prevent the corrosion of metals even in mid-ocean. Warranted *superior* to Red Lead, or any other lead, for any and all purposes for which Paint is required. We are fully aware that these statements will be more or less discredited by many, and although we might produce hundreds of testimonials corroborating our claims, even then doubts would exist; and as the most convincing proofs are obtained by actual test, we simply ask you to *TRY IT!* Submit it to any reasonable test you please, and you will soon find that we have not *overstated the facts*, and that *your interest*, and the interests of *all concerned*, will be subserved by the use of the

ROCKY MOUNTAIN VERMILION PAINT.

ROCKY MOUNTAIN VERMILION PAINT CO. Trade Mark.

Furnished dry, in whole and half barrels containing 200 pounds and upward; also ground in pure linseed oil, in barrels or kegs; also in gallon packages, mixed ready for use.

ALL ORDERS SHOULD BE ADDRESSED TO

WILLIAM H. COREY,

General Agent for the United States and Territories,

No. 20 SABIN STREET, PROVIDENCE, R. I.

CAUTION.

Owing to the great superiority of this Paint over all others, causing a constantly increasing demand, some unscrupulous parties are selling inferior articles of paint under the name of

ROCKY MOUNTAIN.

Be sure that each package bears the Trade-Mark of this Company, as herein shown, without which none is genuine.

LEHICTON PAINT AND LINSEED-OIL MILLS,

C. E. HECHT, Proprietor,

EASTON, PA.

Pure Raw and Boiled Linseed Oil, White Leads and Zincs, Colors, Putty, Varnishes, Japans, etc.

SOLE MANUFACTURERS OF THE

CAR COLORS,

so long used and so highly recommended as the cheapest and best covering for all outside work ever offered. The CAR COLORS are all ground in Pure Boiled Linseed Oil, and packed in all sized kegs and barrels.

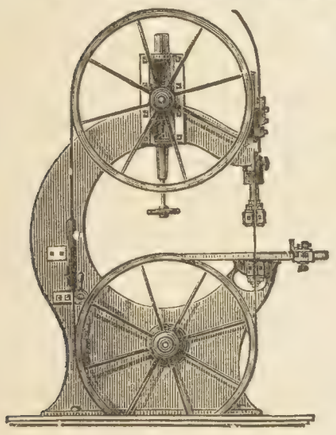
Samples of all the Colors, with Price-List, will be furnished on application.

Sole Agency and Manufactory of Smith & Dean's Patent Crystal Enamel (Filler) for Coach and Car Work.

Wood Cutting Machinery

FOR

Railway-Car Building, Ship-Building, and Band Sawing.



SEND FOR CIRCULAR.

The Celebrated French "**M. PERIN & CO.**" Band Saw Blade,

ANY LENGTH AND WIDTH.

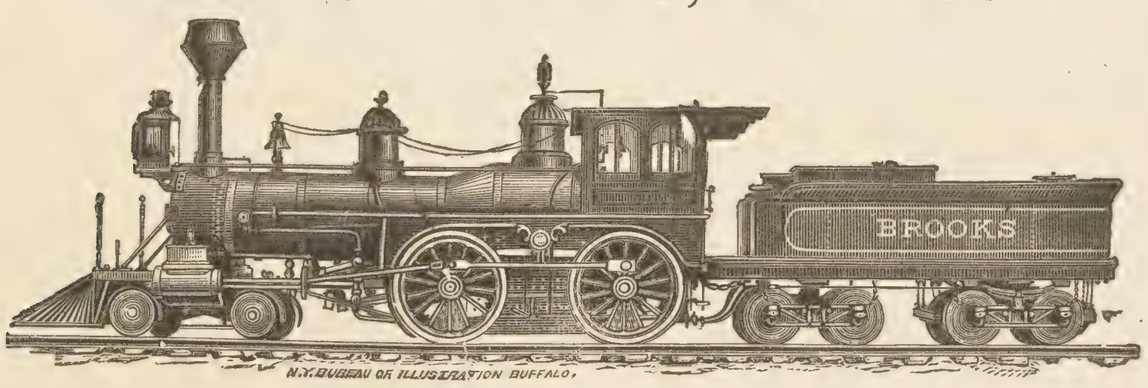
RICHARDS, LONDON & KELLEY,

ATLANTIC WORKS,

22d, Above ARCH, PHILADELPHIA, PA.

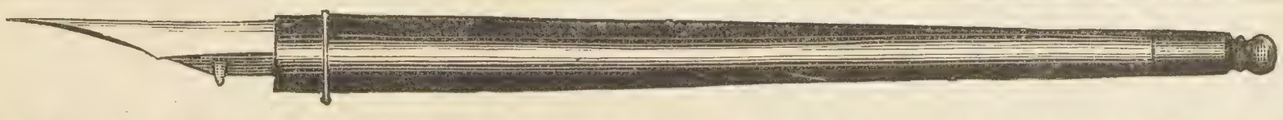
BROOKS LOCOMOTIVE WORKS,

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Orders solicited for Locomotives adapted to every class of Railway service.

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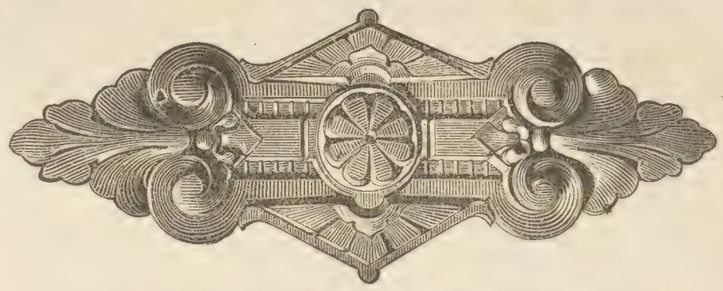


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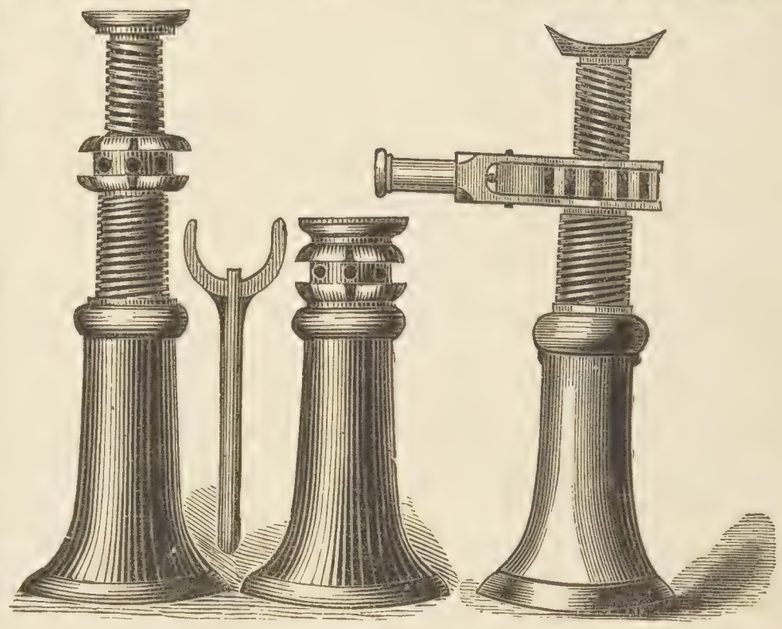
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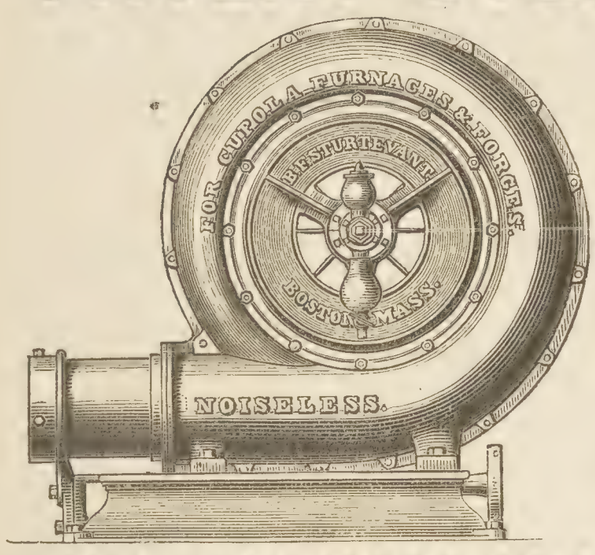
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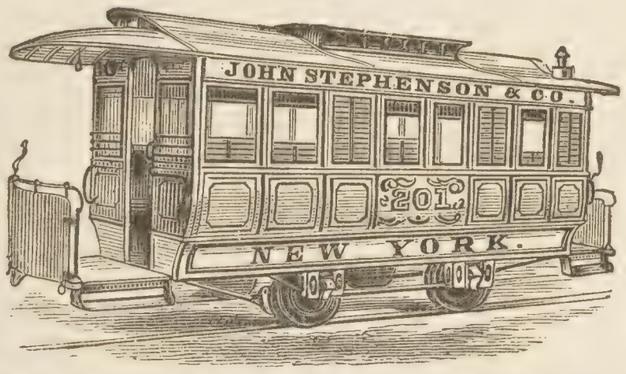
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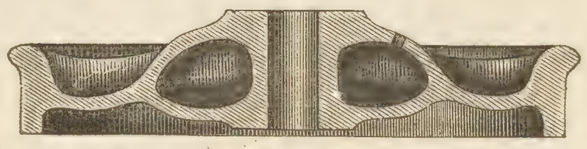
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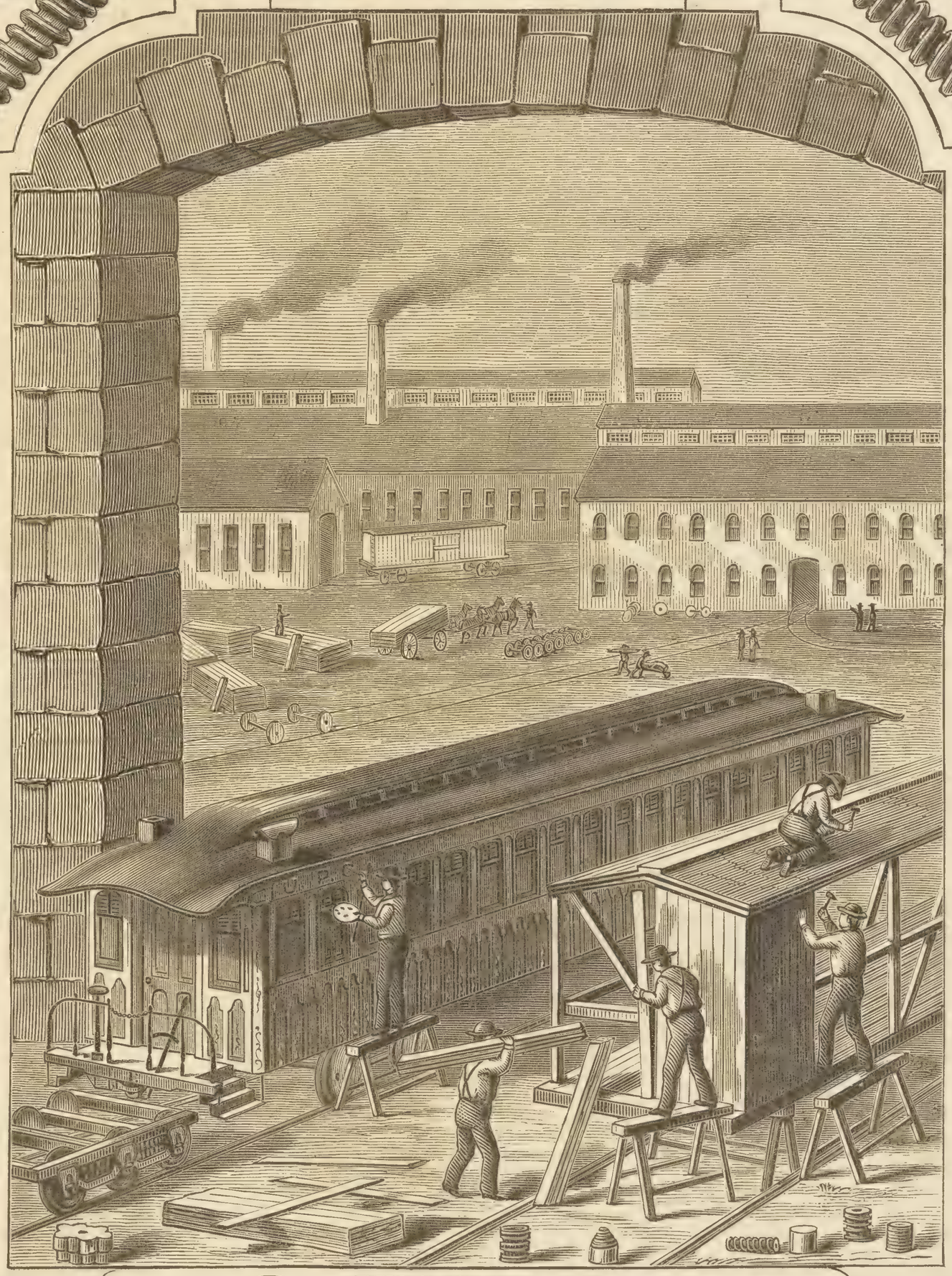
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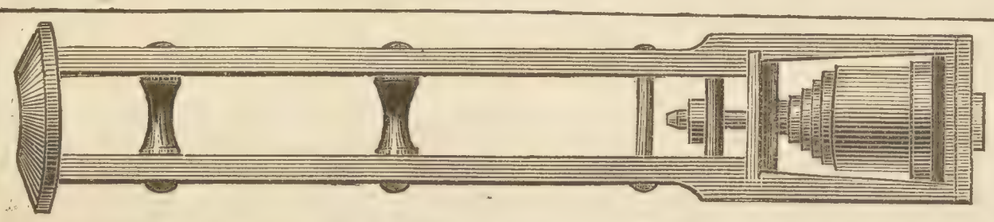
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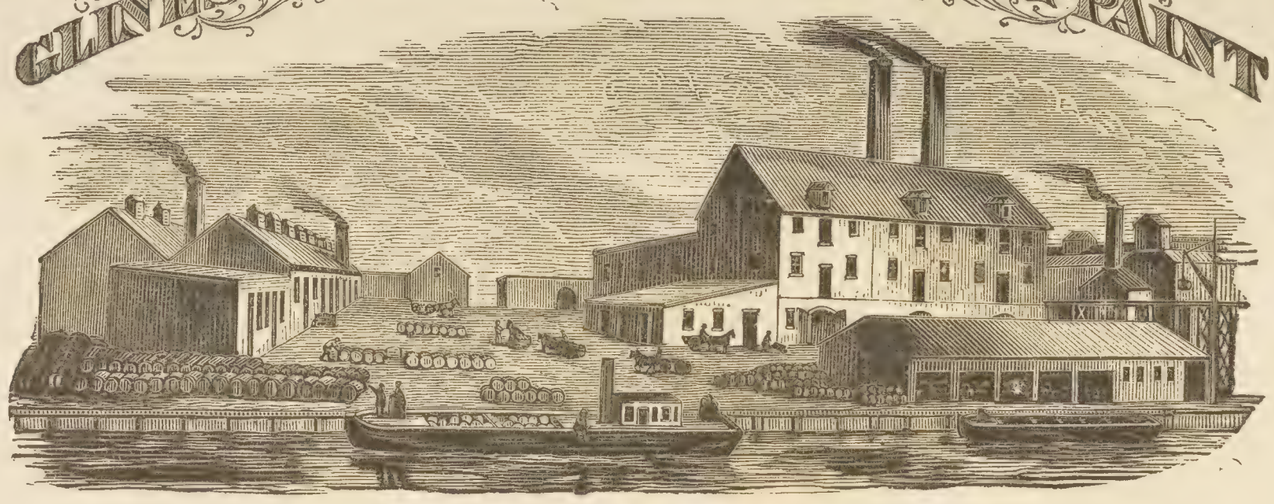
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STOPS ALL LEAKS.

AGENT WANTED IN EVERY TOWN.

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A roof may be covered with a very cheap shingle, and by application of this slate be made to last from twenty to twenty-five years. ***Old Roofs*** can be patched and coated, looking much better, and lasting longer than new shingles without the slate, for ***one third the cost of reshingling.*** This Paint is *practically* fire-proof against sparks or flying embers, and for tin and iron has no equal, as it expands by heat, contracts by cold, and will not corrode in the most exposed places. Roofs covered with Tar Felt can be made water-tight at a small expense. The Slate Paint is ***EXTREMELY CHEAP!***

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The public are cautioned against worthless imitations of our Paints, and those who copy our advertisements.

Orders solicited. Correspondence invited. Send for Book Circular, which contains *hundreds* of references from every State.

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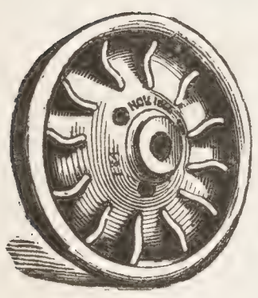
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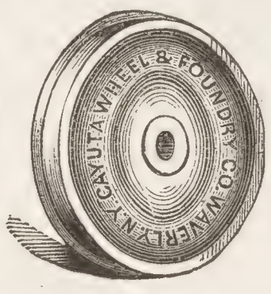
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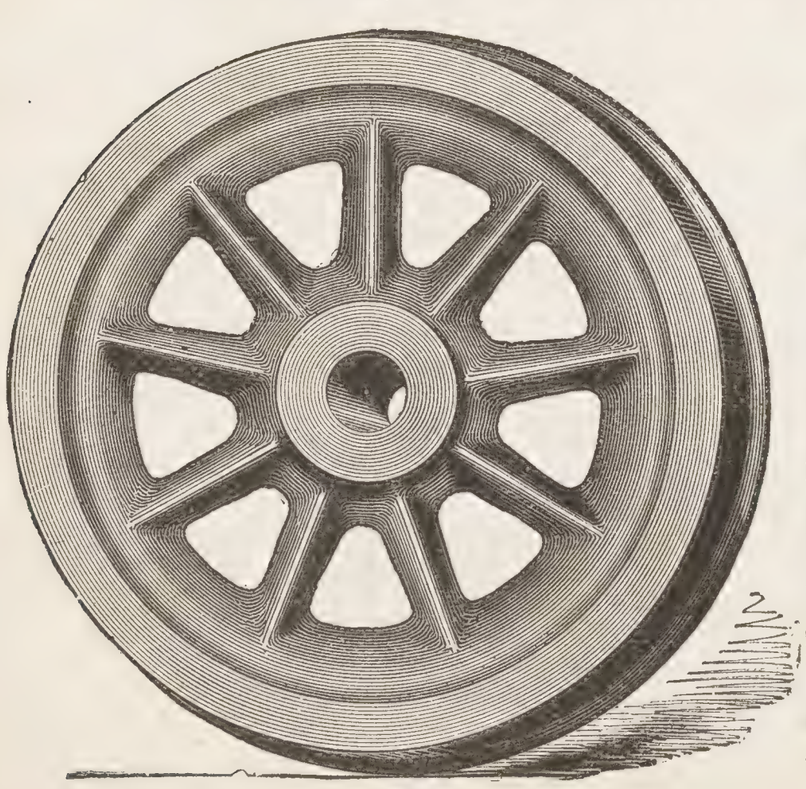
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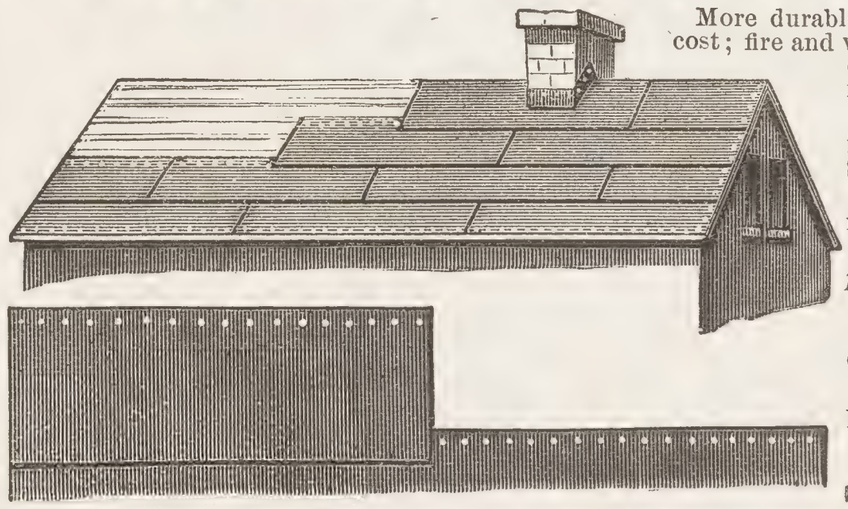
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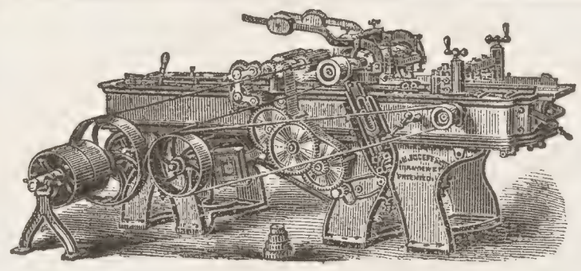
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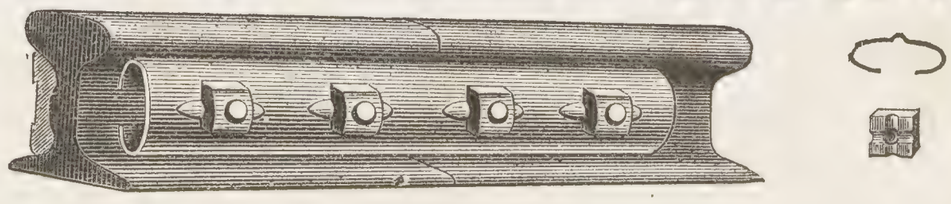
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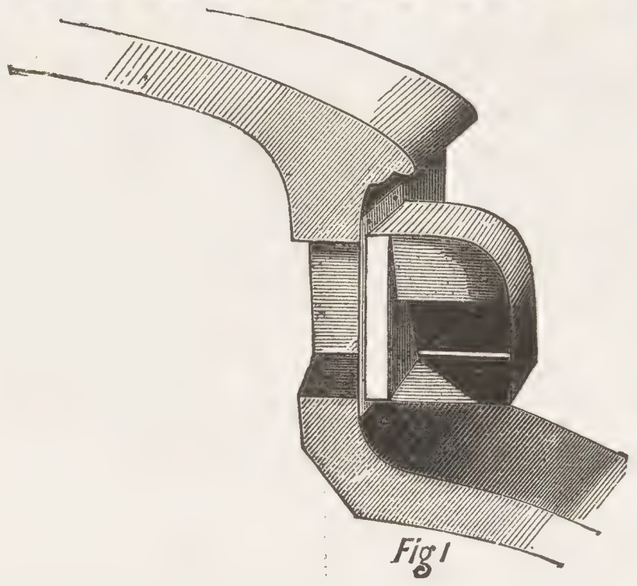


Fig 1

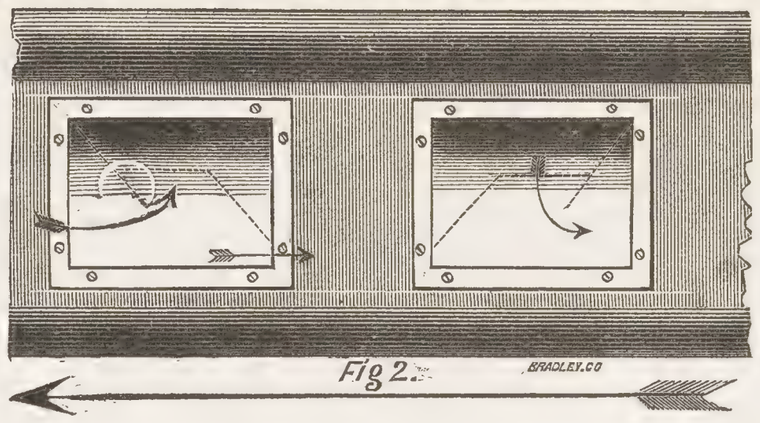


Fig 2.

THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place, it is always in readiness, and runs itself independent of all employees.

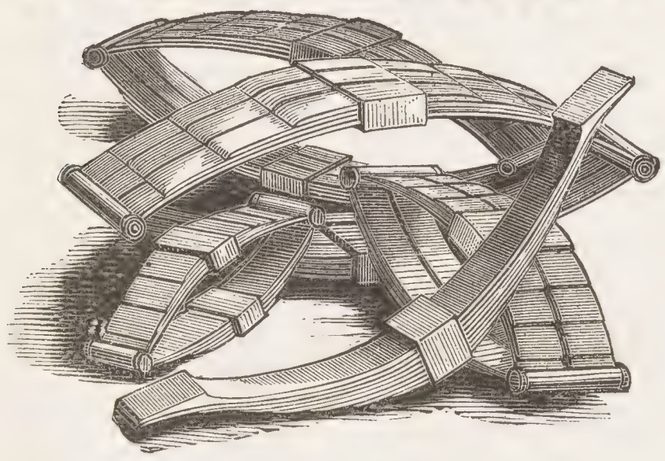
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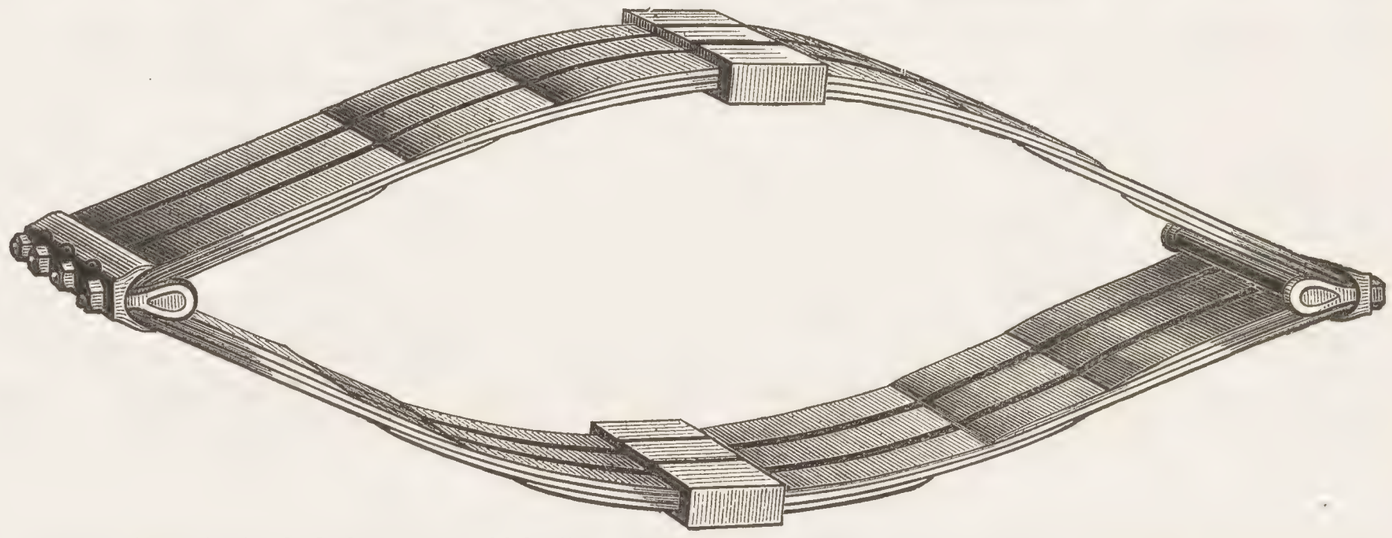
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A continous leaf or bed-plate upon which all the short leaves work, securing a uniform pressure. Equally durable with ordinary elliptics, and saves thirty per cent of dead weight. In successful operation on a number of roads. Made of best cast steel. CHEAPER, LIGHTER, MORE ELASTIC.

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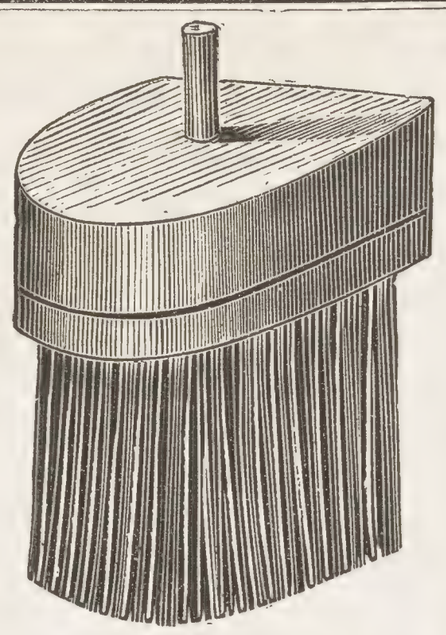
THESE BROOMS ARE USED UPON ALL THE PRINCIPAL RAILROADS THROUGHOUT THE UNITED STATES AND CANADA, AND ARE WARRANTED TO GIVE SATISFACTION.

No Railroad should be without them.

All orders will meet with prompt attention by addressing

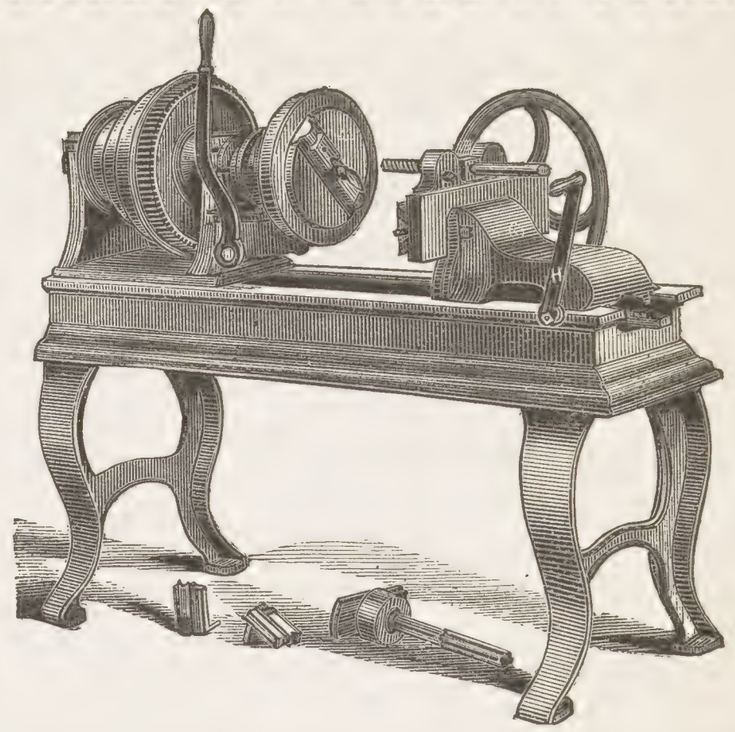
199, 201, and 203 Randolph St.,

CHICAGO, ILL.



Steel Wire Locomotive Snow and Track Broom.

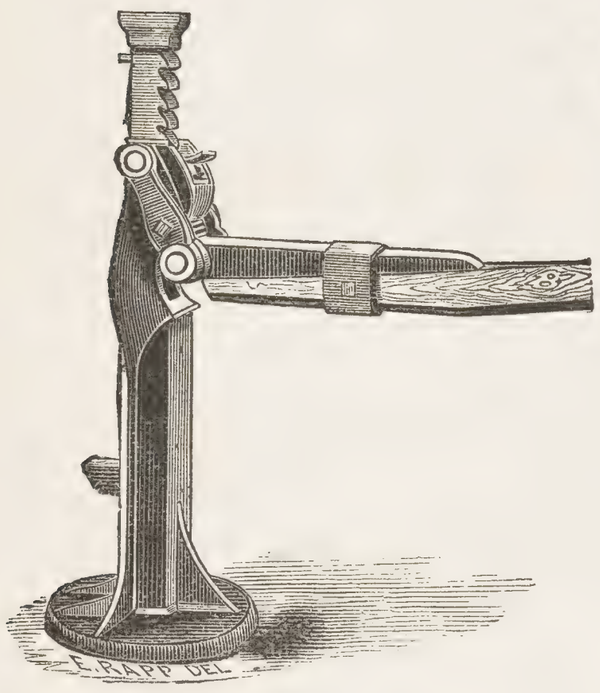
BABBITT'S BOLT-CUTTER.



This is one of the best and most complete ***Bolt-Cutting Machines*** in the market. It will cut all sizes, from ¼ upward to 3 inches, and has no equal in practical efficiency and economy of running, as well as ready adaptation to all kinds of work occurring in a Machine Shop. Two sizes are made, Nos. 1 and 2 *Send for Circular.*

P. HICKEY, Auburn, N. Y.,

Sole Manufacturer.



Leffel's Patent Lever Jack.

Patented Dec. 10, 1850; Patented Nov. 15, 1864; Renewed Nov. 28, 1864.

ADAPTED TO ALL KINDS OF LIFTING,

BUT ESPECIALLY TO

BRIDGE AND RAILROAD WORK.

Nearly all the Railroads in the United States have these Jacks in use, and the testimony in every instance shows a very great economy in

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Orders solicited and promptly filled. Address,

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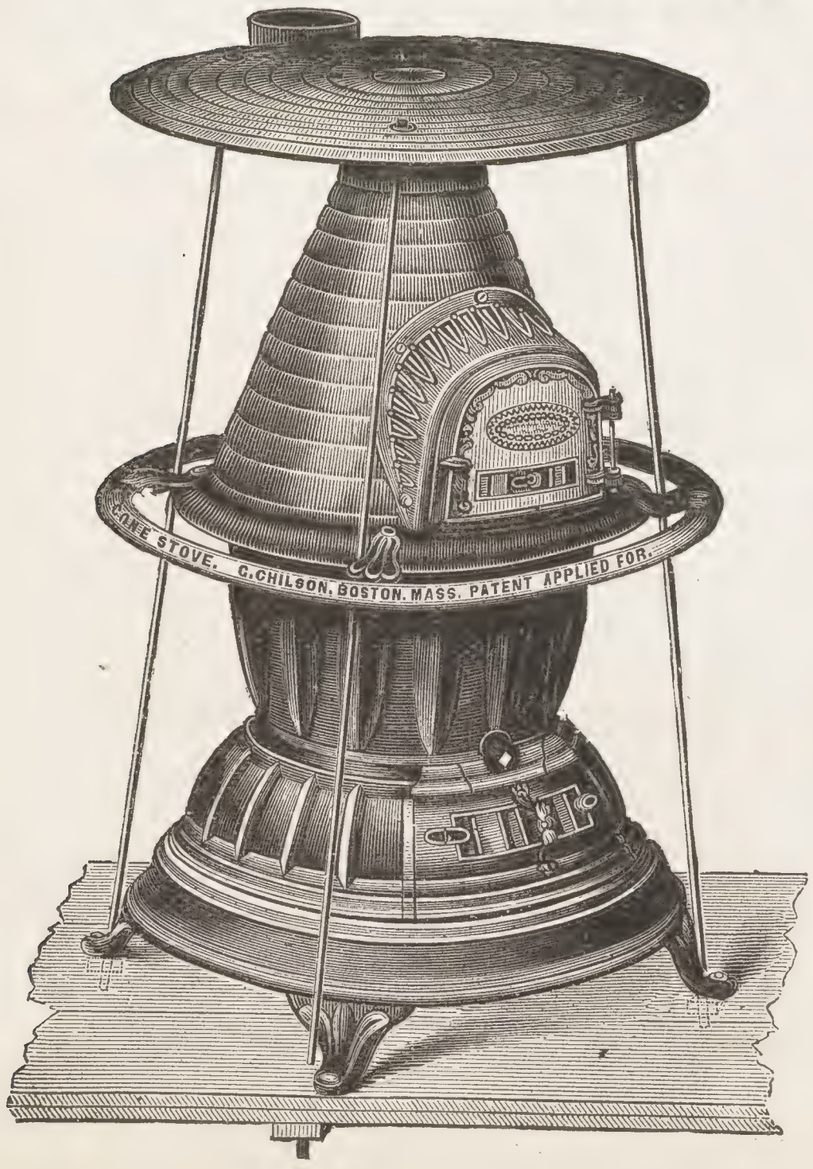


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A NEW RAILWAY CAR STOVE.

Chilson's Patent Cone Disk Stove

ON A NEW AND MODEL PLAN.



I WOULD respectfully call the attention of Railway Managers and others interested in warming Railway Cars, Station Houses, etc., to this Stove, which has been thoroughly tested on several of our railways for a few years past, and has proved in every instance the most successful plan yet devised for thoroughly warming Railway Cars. This Stove is on a new and model plan, differing in principle and operation from all others in the United States. I claim for it *Safety, Economy, Durability, Simplicity, Cleanliness, and Beauty of Design.* Its peculiar merits may be stated as follows:

1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.
2. The broad radiating disk prevents the heat from ascending to the upper part of the car or room, but distributes and throws it down to the floor, thoroughly warming the lower currents of cold air in the car or room for a great distance around the Stove, thus securing the long desired object of making the *lower part of the car and floor comfortably warm, especially for the feet.*
3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stoves.
4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.
5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*
6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories, Stores, Offices,* RAILROAD CARS, and STATION HOUSES, *School Rooms, Workshops, etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

The BOSTON AND PROVIDENCE RAILROAD COMPANY have over two hundred of these Stoves in use, and the BOSTON AND ALBANY and several other Roads are adopting them, with the most perfect success.

BOSTON AND PROVIDENCE RAILROAD CORPORATION,
Superintendent's Office, Boston, April, 1873.

GARDNER CHILSON, Esq.: *Dear Sir:* We have about two hundred of your new "Cone" Disk Stoves in use, (a part of them for nearly five years,) for warming Passenger Cars and Stations. I can truly say that they have given entire satisfaction. These Stoves possess many important advantages over any other we have ever used, viz.: for warming the floor and displacing the cold air in the lower part of the car, whereby they are rendered much more comfortable, especially for the feet, than by any other plan known to us. The Stove is more economical in the consumption of fuel, more substantial in construction, and consequently requiring less repairs than any other in use, and so securely constructed as to prevent fire from getting out of the stove even should the car be *overturned.* I cheerfully give my testimony in favor of this Stove, and commend it to all Railroad Managers.

Yours, etc., A. A. FOLSOM, *Superintendent.*

Numerous other testimonials received from Railroads and other persons having these Stoves in use in Halls, Stores, etc., may be seen at office. Bolts are not required except for Cars and Steamboats.

Chilson's Improved Celebrated Cone Furnaces, for setting in Brickwork or in Portable Casings, Chilson's Unrivaled Double-Oven Brick Cooking-Range; Chilson's New and Splendid Arlington Portable Range; Chilson's very Superior Arlington Cooking Stove; Parlor, Office, and Store Stoves, Parlor Grates, Registers, Ventilators, etc.

Special attention given to putting up Furnaces and Ranges, and the ventilation of buildings in any part of the country.

☞ Nothing but strictly first-class work is manufactured by me. ☜

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FOUNDRY AT MANSFIELD, MASS.

GARDNER CHILSON.

RAWLINS' METALLIC PAINT.

Warranted Fire, Water, and Weather Proof.

Will cover more surface and outwear any paint manufactured.

CHICAGO, BURLINGTON, AND QUINCY RAILROAD,
MASTER PAINTER'S OFFICE,
AURORA, ILL., March 15, 1875.

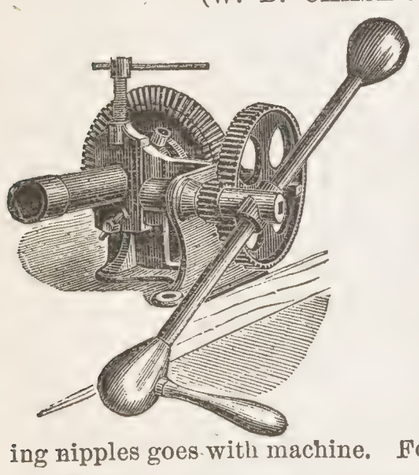
RAWLINS' METALLIC PAINT CO.

GENTLEMEN: I have had your IRON PAINT in test for about six months, and find it one of the best, if not the best, Iron Paints I have ever seen. *I put two coats of it, mixed with boiled oil, on a piece of sheet-iron, and buried it in* STRONG BRINE, *about six months ago, and it has stood the test, and* DOES NOT SHOW ANY SIGNS OF RUSTING THROUGH THE PAINT. I have also used it on Locomotive work, and find that it COVERS FAR MORE SURFACE than any Iron Paint I have used.

Very respectfully yours,
D. C. COOLEY.

CHASE'S
Pipe-Cutting and Threading Machine.

(W. D. CHASE'S PATENT.)



This important tool is designed to fill a want long felt by STEAM AND GAS FITTERS AND MACHINISTS for cutting and threading pipes rapidly and cheaply. An Apprentice Boy, with one of these, can do more work than Two Men with old appliances under the old system. No PIPE SPLITTING! NO BEVEL INSIDE OR OUT! It cuts threads and makes nipples for all sizes of pipes, from ⅛ to 2 inches. Weighs only 100 lbs. Stronger than any machine made. A full set of collars and lengths for making nipples goes with machine. For Sale by

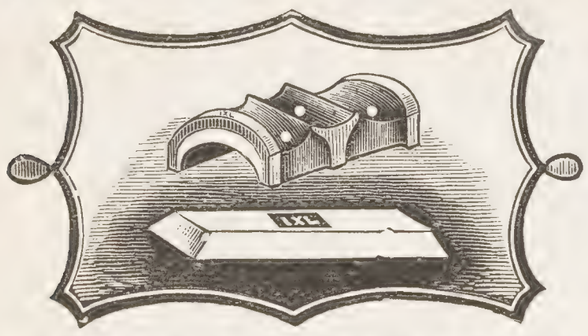
MORRIS, TASKER & CO., Philadelphia, New-York, and Boston.

Address.

The Chase Manufacturing Co.,
120 Front St., New-York.

Send for Circular.

ORGANIZED MAY 1869.



I X L METAL COMPANY

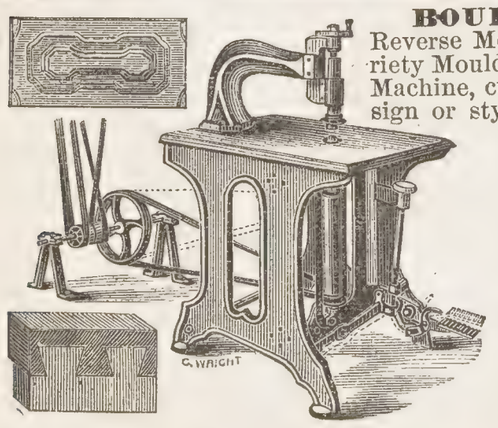
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Sole Proprietors and Manufacturers of the

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Railroad Companies will find a great saving in their expenses, and very little trouble from hot boxes, by using these bearings. A sample set for a trial sent free of charge, by sending a Brass for pattern. Mills, Steamboat Companies or others, will find this a superior Composition for Bearings.



BOULT'S PATENT

Reverse Motion, Paneling, Variety Moulding and Dovetailing Machine, cuts Panels of any design or style of Mould in the solid wood, with neatness and dispatch.

Routes and grooves for Windows, Stairs, Cars, Bridges, etc., etc.

Moulds, fine Bracket and general Scroll Work. It is a first-class Shaper and Moulder, Dovetails all kinds of Drawer and Joint Work with thick or thin stuff. Warranted Simple, Durable and Efficient. Send for circular and sample of work. Manufactured only by B. C. MACH'Y CO., Battle Creek, Mich.

IRON CLAD PAINT.



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CLEVELAND, OHIO.

This Company owns and manufactures under WM. GREEN'S several patents, and is the only Company in the world that makes Paint from pure hard Lake Superior Iron Ore, such as is used in furnaces for making Pig Iron.

The most Economical, Most Fireproof, Most Waterproof, Most Durable, and Most Useful Paint made.

Used by L. S. & M. S. RY.	I. & ST. L. R. R.
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Etc., etc.

OFFICE OF PURCHASING AGENT
LAKE SHORE AND MICH. SOUTHERN RAILWAY,
CLEVELAND, O., Sept. 12, 1873.

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GENTLEMEN: Your "Metallic Paints" known as "*Iron Clad Paints*" have, in the past six years, been extensively used and thoroughly tested by this Company, as to their *covering capacity, durability, and resistance to atmospheric changes*—latter "paint destroyer"—the most difficult to overcome in outside paints. We can emphatically accord them the highest position over any paint heretofore produced, for Cars, Roofs, Stations, Bridges, etc. The monthly increase of our orders is the best evidence that the Paint is constantly growing in favor with our mechanics.

Very respectfully yours,
A. C. ARMSTRONG,
Gen'l Purchasing Agent L. S. & M. S. R. R.

Brinckerhoff, Turner & Co.,

Manufacturers and Dealers in

COTTON DUCK,

For Car Covering and Car Seats,

14 to 150 inches wide. Also Agents

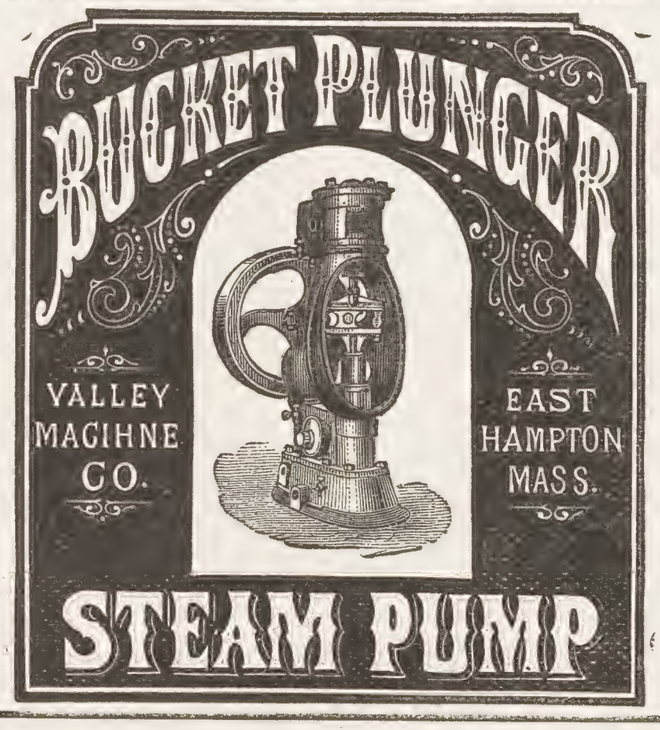
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Are in full operation and stocked with selected material for manufacturing

Box, Platform and Coal Cars

Prices and terms to suit the times. Orders solicited. Address,

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BOILER TUBE EXPANDERS,

AND DIRECT-ACTING STEAM HAMMERS.

Communications by letter will receive prompt attention.

Jacks for pressing on Car-Wheels or Crank Pins made to order.

WALL'S MAGIC RENOVATOR.

For Cleaning and Polishing Gold, Silver, Nickel, Brass, Copper, and Lacquer Gilt on Metals. A chemical liquid free from acids, which will remove all tarnish, dirt, and grease, from whatever cause, almost instantaneously, and without injury to the metal.

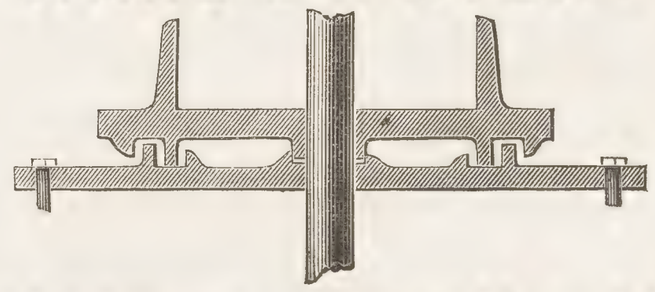
Price, per gallon, $5; in pint bottles, $1; ½ pint, 50 cents. Discount of five per cent on orders for ten gallons. A liberal commission to Agents.

Samples sent on application to

JAMES J. WALL,

P. O. Box 45 Tremont, Westchester Co., N. Y.

WARD'S PATENT



CENTER OR TRANSOM PLATE

FOR RAILWAY CARS,

With Oil Receptacle for Bearing-Ring to work in. They are acknowledged to be the best in use. See description and drawings in CAR-BUILDER for January, 1874.

Address, AMBROSE WARD,
ALTOONA, PA.

ST. CHARLES CAR CO.

This Company is now prepared to furnish on short notice, and at low prices, all kinds of

FREIGHT CARS,

built in the most approved manner and of the best material. Orders respectfully solicited. Address,

ST. CHARLES MFG. CO.,
ST. CHARLES, MO.

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THOS. ALLEN, Pres't St. Louis, Iron Mountain & Southern R.R.
T. MCKISSOCK, Gen'l Sup't St. Louis, Iron Mountain & S. R.R.
A. W. LOPER, Ass't Sup't St. Louis, Iron Mountain & S. R.R.
WM. HOGE, Pres't St. Louis, Kansas City & Northern R.R.
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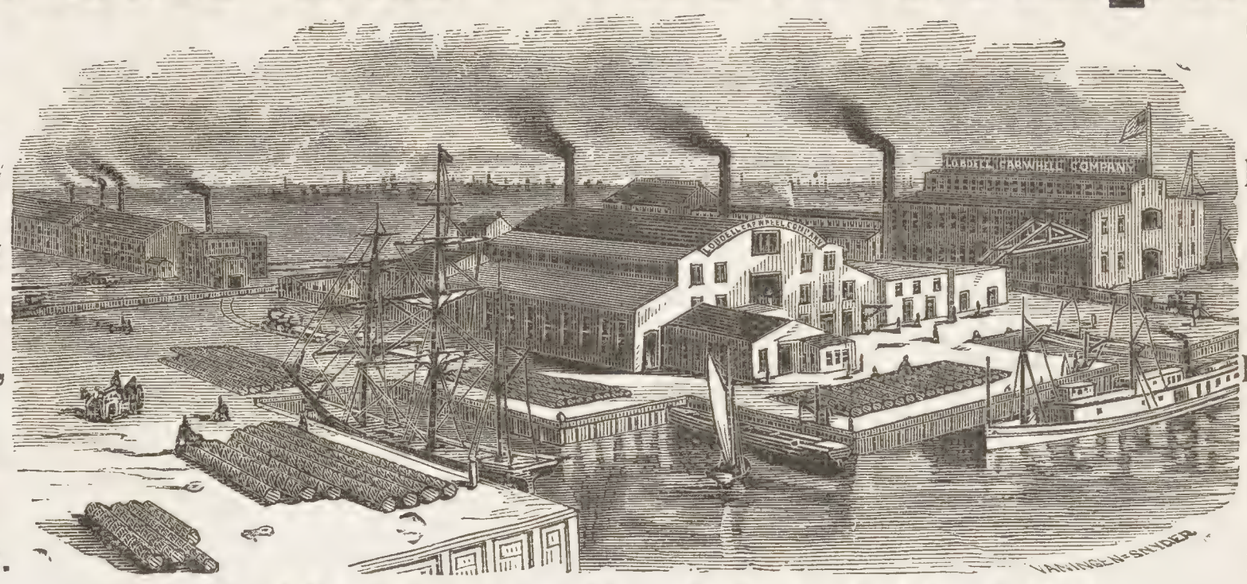
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Having perfected and patented our machinery, we guarantee all Moss put up by us to possess the following qualities—*full length of fibre, freedom from dust, strictness of grade, preservation of elasticity, and exactness of weight*, and used with great success by the leading carriage makers, upholsterers and railroad companies in the United States, as the most economical substitute for curled hair.

Lobdell Car-Wheel Company.

SINGLE AND DOUBLE PLATE AND HOLLOW SPOKE WHEELS, FOR City and STEAM ROADS.



CHILLED ROLLS FOR PAPER, BRASS, COPPER, AND ROLLING MILLS. Castings of all Descriptions.

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VARNISH MAKERS,

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RAILWAY CAR VARNISH.

Elastic, pale, and extremely durable, possessing great brilliancy of lustre, and producing a hard, fine **finish,** resisting in the highest degree effects of time and exposure. Should be used over our Rubbing.

RAILWAY RUBBING VARNISH.

Hard-drying, works freely on large panels, will not sweat out, and is very desirable where a fine and durable surface is requisite on which to finish.

LOCOMOTIVE VARNISH.

Dries readily, with brilliant lustre; durable under severest exposure in any climate.

INSIDE CAR VARNISH.

A hard-drying Varnish for inside work; is very light-colored, flows well, and dries in about 12 hours.

JAPAN GOLD SIZE.

Very pale, and preferable to Japan as a drier for delicate colors.

COACH PAINTERS' JAPAN.

A Superior Drier.

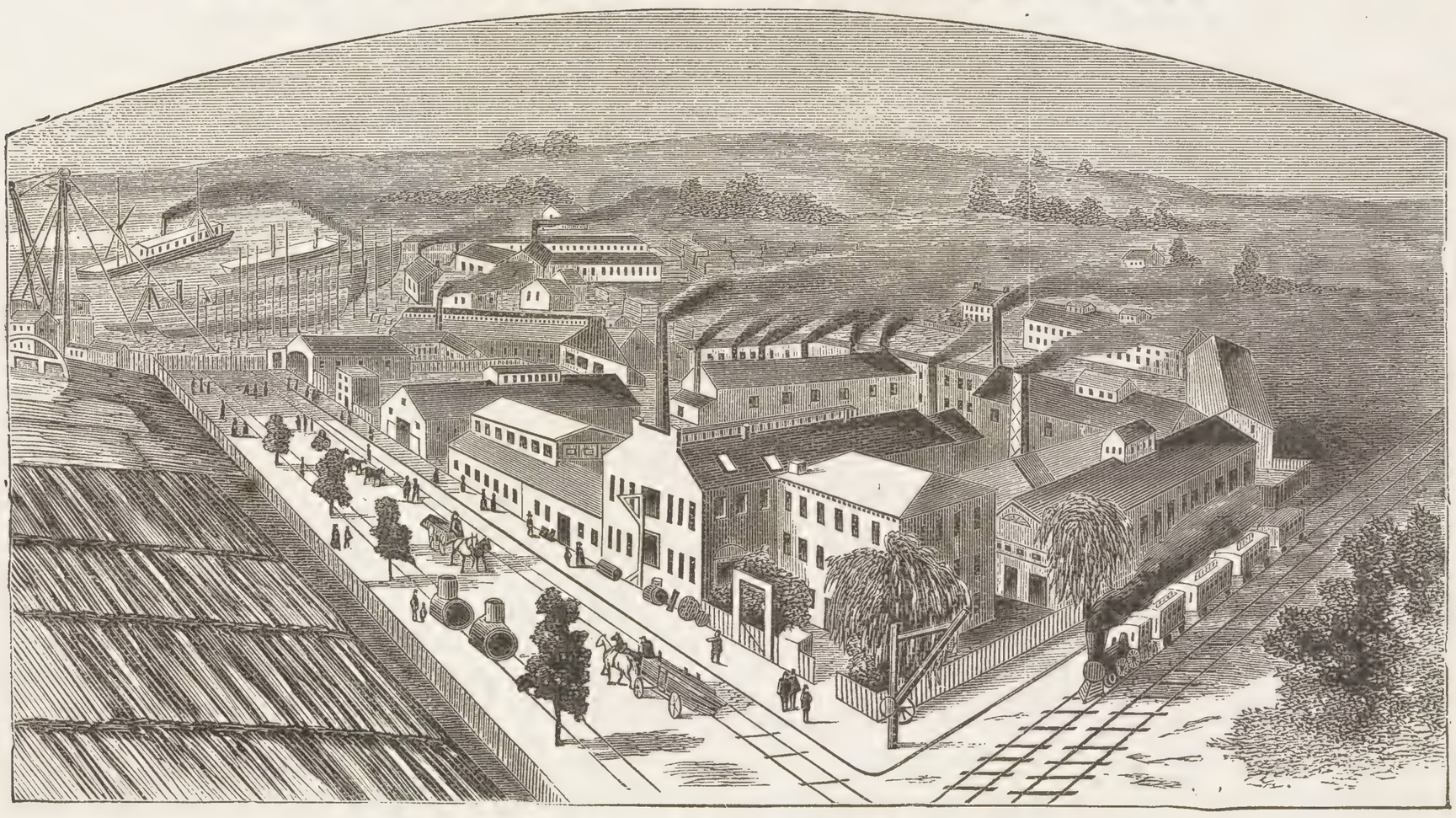
These **VARNISHES** are made with the greatest care and skill, from the best grade of stock, and designed especially for

RAILWAY CAR AND LOCOMOTIVE WORK.

They dry hard, and resist effectually the severest exposure to action of **Cinders, Smoke, or Climate,** having been tested for many years by the leading Railroads of this Country and have proved, for **brilliancy** and **durability,** fully equal to any of either Home or Foreign Manufacture.

THE HARLAN & HOLLINGSWORTH CO.,

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BUILD ALL KINDS OF

RAILROAD CARS:

FIRST and SECOND-CLASS DRAWING-ROOM, SLEEPING, BAGGAGE, MAIL, and EXPRESS, BOX, and FLAT.

MURPHY & CO., NEWARK, N. J.,
MURPHY, SHERWIN & CO. CLEVELAND,
Varnish Makers.

We call attention to the following prices of our Varnishes especially adapted to Railway Uses, and submit that they combine more prominently than any others, the INDISPENSABLE REQUISITES for Railway Consumption. They are of heavy body, light color, quick drying, and are guaranteed to give a maximum of durability.

Wearing Body, (For Outside Finishing.)	**$5 50**
Hard-Drying Body, (For Under Coats on Cars.)	**5 00**
Rubbing Body, (For Under Coats on Cars.)	**4 50**
Inside Car, (For Interiors of Cars.)	**4 50**
Engine Finishing, (For Last Coats.)	**5 00**
Engine Rubbing, (For Under Coats.)	**4 50**
Japan Gold Size, (For Binding and Hardening Colors.)	**3 50**
C. M. Japan, (For Drying and Binding Paints.)	**2 00**
Black Enamel, (For Smoke Stacks of Engines.)	**3 00**
No. 1 Black, (For Iron-Work.)	**1 50**

UNIFORM SUPERIORITY IN QUALITY AND FIXED PRICES TO ALL will continue to characterize these goods, and Satisfaction in their use is assured.

JOHN JEWETT & SONS,

182 FRONT ST.,

New-York,

MANUFACTURERS OF

PERFECTLY

Pure

WHITE LEAD AND LINSEED OIL.

JEWETT & SONS PERFECTLY PURE WHITE LEAD TRADE MARK

JEWETT'S PERFECTLY PURE LINSEED OIL RAW, BOILED & REFINED.

JOHN T. LEWIS & BROS., WARRANTED PURE WHITE LEAD. PHILADA.

TRADE MARK.

JOHN T. LEWIS & BROS.,

No. 231 South Front Street,

PHILADELPHIA,

MANUFACTURERS OF

White Lead, Red Lead,

LITHARGE,

ORANGE MINERAL,

LINSEED OIL,

AND PAINTERS' COLORS.

☞ READ ECKSTEIN, HILLS & CO. ADVERTISEMENT.

Page 1.

THE DISNEY CAR COUPLER,

Patented June 24th, 1874. Manufactured by

F. E. CANDA & CO.,

CHICAGO, ILL.

Fig. 1.

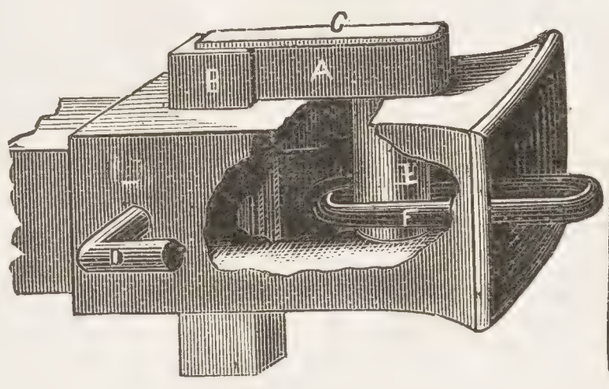


Fig. 2.

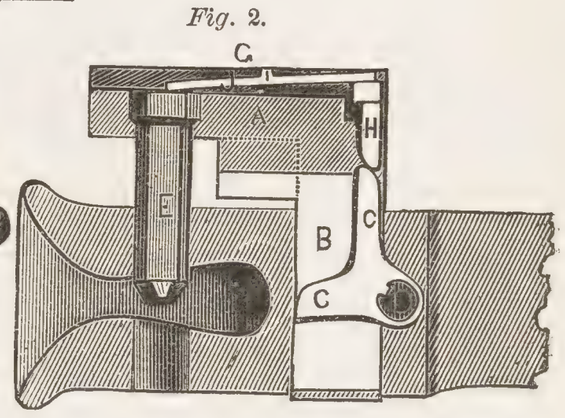


Fig. 1 represents the draw-head with a portion broken away to show the interior.

Fig. 2 represents a vertical, sectional view. *A B* we designate *The Drop*, the upper part *A* serving as the pin-holder. *D* is a lever by which the device is operated, fastened to a shaft passing through the draw-head. *C C* is a forked piece keyed to this shaft. *H* is a small loose pin. *E* is the large pin for securing the link *F*. *J* is a lever resting on the heads of pins *E* and *H*, with its fulcrum on cap-piece *G*. *Then*, when set for coupling or uncoupling, as in Fig. 2, the link *F*, in passing the mouth of the draw-head, raises pin *E*, which by lever *J* forces pin *H* against and displaces the upper arm of *C C*, allowing the *drop* to fall, carrying pin *E* with it.

From the above cuts and description it is apparent that this device combines simplicity in its construction, reliability in its working, and durability in all its parts.

We designate as points of special advantage:

That working from the side of the draw-head, it leaves no opening at the top for dirt, gravel, or accumulations of ice and snow to interfere with the working of the coupler.

That, while the link is always held in a horizontal position for entering, yet it has sufficient vertical movement to accommodate itself to cars of different heights, not exceeding a variation of six inches, without using the crooked link.

That the mouth of the draw-head is of such shape as secures the pin from all liability of bending or breaking.

That it always couples when desired, or set for coupling, and will *never* couple when not desired.

That, working readily from the top and sides of cars, there is no risk of life or limb.

That the pin can never be lost or stolen.

And further, *that* from its reliability of working, and durability of parts, combined with the device for securing it to passenger cars, makes *This Coupler* the safest and by far the most economical *Passenger Car* Coupler ever introduced.

The Disney Car Coupler, wherever tried or however thoroughly tried, has given the most perfect satisfaction, both as a Freight and Passenger Car Coupler.

For further information, address

H. C. KIBBE, 419 California St., San Francisco, Cal.,

AND

F. E. CANDA & CO., Railroad Contractors and Car Builders,

79 SOUTH CLARK ST., CHICAGO, ILL.

THE

Atlantic White Lead

AND

LINSEED OIL COMPANY,

Manufacturers of

WHITE LEAD,

DRY AND IN OIL.

RED LEAD AND LITHARGE,

CRUSHERS OF LINSEED OIL.

ATLANTIC WHITE LEAD. PURE. WARRANTED. ROBERT COLGATE & CO.

TRADE-MARK.

Robert Colgate & Co.,

287 Pearl St.,

NEW-YORK.

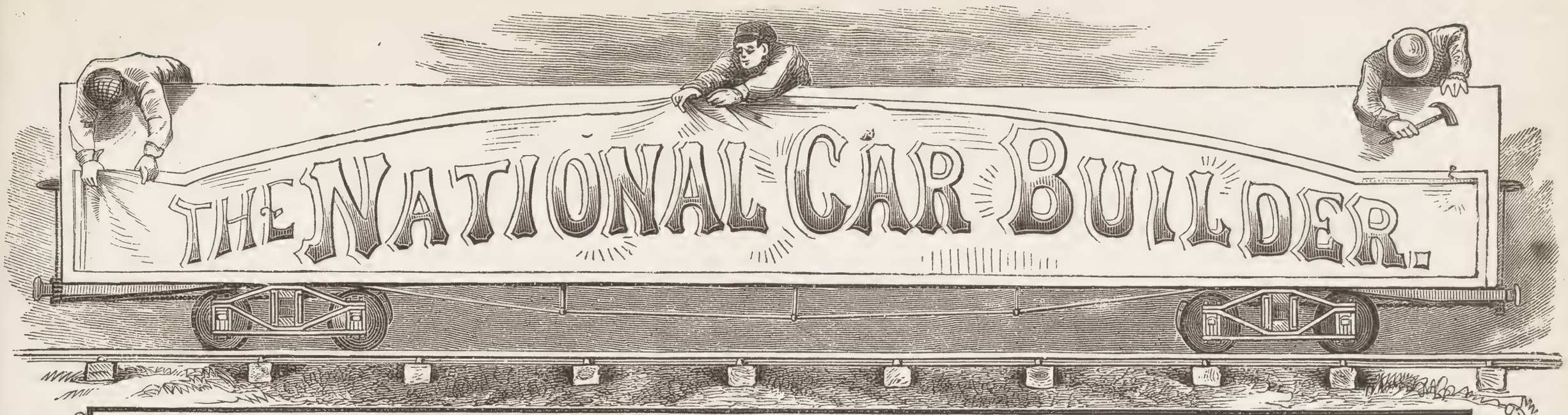
KATAHDIN CHARCOAL PIG IRON.

O. W. DAVIS, Jr., Manufacturer, BANGOR, MAINE.

SOUTH BOSTON IRON CO.'S TESTS OF KATAHDIN PIG IRON, 1874:

	Density.	Tensile strength per square inch.
No. 2 Pig Iron,	7,2002	18,894
" 3 "	7,2432	26,928
" 4 "	7,2305	30,765

Nos. 1 and 2 are soft and strong, suitable for machinery and fine castings, boiler plates and steel. Nos. 3 and 4 are close-grained and tough, adapted for steam cylinders, radiators, locomotive castings, car-wheels, hydraulic presses, etc. All grades contain less than one-tenth of one per cent of sulphur or phosphorus. Shipped by rail or water from Bangor to any part of the country.



DEVOTED TO THE INTERESTS OF RAILWAY ROLLING STOCK.

Vol. VI. No. 5. | MAY, 1875. | $1.10 per Annum. Single Copies, 10 Cents.

A Common-Sense View of the Case.

A SPEECH recently delivered by Judge Joseph Gillespie, of Edwardsville, Ill., contains the following forcible statement of the injustice of the Granger crusade against railroads :

" Railroad companies ought to be dealt with justly. They are composed of individuals who are no better and no worse because they are organized into a railroad incorporation. Sometimes the funds of widows and orphans were invested in these organizations, and common justice and common humanity, as well as good policy, dictated just treatment toward them. He was sorry to see the crusade which was being carried on, in the name of the farming class, against these corporations. He said we were taught to look upon corporations as enemies of the human family. What are they? They are mere combinations of natural persons, who undertake to carry out collectively what individual effort would be unable to accomplish.

" Corporations dig our canals, build our manufactories and hotels, erect our bridges over rivers, and construct our railroads. In short, there is hardly a praiseworthy enterprise, or a beneficent measure, which is not the result of the aggregation of capital, effected through the instrumentality of private incorporations ; and the unreasoning warfare which is now going on indiscriminately is unworthy of the age. One of the pretenses for this thing is that railroad charges are too high. Any man you meet will tell you without hesitation that they extort from the public at a dreadful rate. You ask if he knows what it costs to construct them, or to operate them, or what accidents will befall them, he will answer No, and you see how little reliance is to be placed on his judgment. Then it is charged that they discriminate in respect to charges between different persons and localities. This is true ; and who does not act accordingly? The miller sells his flour for a greater price at the end of the market than at the place of manufacture. The merchant gives better bargains to his constant customers who pay promptly, than to those who trade all around or pay when convenient. There is not a branch of human industry carried on in which there is not more or less discrimination in the price paid for labor and commodities. The farmer himself discriminates. He pays more to a tried and reliable hand than to one who is unknown. What is the remedy if the railroads do overcharge or unjustly discriminate? If they charge more than you can afford to pay, betake yourself to your old method, by wagon and the common road. If your merchant overcharges, you don't think of running to the legislature to have commissioners appointed to put a price upon his goods, and have lawyers employed at the public expense to sue him for selling above the limits. No such thing. You invite other merchants to do business in his neighborhood, and give them your patronage, and make competition bring down prices. And this is the only way by which prices can be reduced.

" Legislation never had, and never will have, the least effect in reducing prices. Invite more railroads, and you will in due time have the full benefit of competition. Prices will come down to the lowest figures at which roads can run, and this is as low as they ought to be. How is it known that railroad charges are too high? It certainly is not from dividends declared, for there is hardly a road in this State that pays any dividends. The receiver of the Rockford, Rock Island and St. Louis Railroad Company reports, a few days since, that the net earnings of that road for the month of January, 1875, were but a trifle over $2000, and that improvements which must be made immediately will cost about half a million. What has become of the eight or ten millions of money put into that enterprise? Gone where the 'woodbine twineth.' Not through any mismanagement of the road, but from the unfavorable condition of the business of the country."

The Requisite Qualities of Lubricants.

PROFESSOR P. H. VAN DER WEYDE, in a paper read before the American Institute, makes the following observations in regard to the qualities of lubricants :

"I have made it a subject of careful study to find out the different qualities required for a perfect lubricant, have carefully analyzed different lubricants, have compared them by means of apparatus constructed for this special purpose, and I have finally come to the conclusion that a perfect lubricant, which will answer all the requirements, must satisfiy ten distinct conditions, which I will enumerate.

" I have gone over this labor more as a labor of love than of profit, being persuaded that the subject is most important, more so than the majority of people are aware of; we only have to take in account the large amount of useful power lost all over the world, even in the best constructed machinery, by inferior lubricants, an amount of which easily two thirds, could be saved ; also the ruinous effect on the machinery itself of inferior lubricants, heating it, wearing it out, throwing it much sooner out of repair, and causing it to last not half the time that it would do with perfect lubricants. The conditions required of a perfect lubricant are as follows :

" 1. It must not freeze or solidify at the temperature of our coldest winter days, say 10° below zero, Fahr., as is the case with sperm and lard oils, which freeze, some at 40°, some at 50°, and even at 60° above zero.

" 2. It must not dry and form a gummy crust like linseed-oil, which has the virtue of not freezing before reaching 8° or 10° below zero, but which is only an excellent lubricator as long as it is fresh ; it is, however, a drying oil, and soon forms a crust. Fish and rape oil will do the same, only it takes much longer time before they gum.

" 3. The oil must not be a compound of fatty acids with glycerine, as all those oils become rancid by exposure to the air, which rancidity is only a decomposition by which the acid is set free; this acid acts on metal like brass, corrodes it, as is seen in the green color of many lubricants when in contact with brass ; all vegetable and animal oils have this chemical composition, and therefore are objectionable on this account.

" 4. Those same oils will, for the same reason, produce spontaneous combustion when the woolen or cotton rags used for cleaning the machinery are saturated with it, and accumulate in a closet or box ; the action of this oil on the fibres of the rags produces a steadily increasing heat, and has been the cause of many a fire, as is universally known. I observe in the annual of *Mechanical Technology* (Berlin, 1863, page 47) that Professor Bolley draws attention to the fact of cases having been found where the fatty acids of the lubricants came with the feed-water in the steam-boiler, and, combining with the lime in the water, increased the incrustation considerably.

" 5. The oil must not have been treated with sulphuric or other acids, as is the case with refined rape-oil ; besides the injurious effect of the accidental remnant of those acids on the metal, the lubricating smoothness of the oil is destroyed, it feels rough between the fingers, and does not diminish the friction as much as the same oil not treated with acids, as I prove by experiment.

" 6. It must be pure and perfectly transparent, and contain no gritty, earthy, or mineral matter which will attack the machinery. About the transparency spoken of under this head, I will still remark that the color is of no importance ; the lighter colored oil is not better than the dark red ; I have even found that all attempts at giving oil a very light color are made at the expense of some of the lubricating qualities, the transparent but dark reddish oil being in reality the best lubricator.

" 7. It must not evaporate and leave the parts dry, as is the case with kerosene, coal-oil, and in general all distilled oils, which being products of distillation, that is, condensed vapors, will of course evaporate again, principally when the parts become warm by friction or otherwise.

" 8. Not only can no good lubricant be the product of distillation, but the substance itself must never have been submitted to a certain degree of heat, sufficient to cause a chemical change in its constituents to take place ; when an oil has been boiled it is ruined as a lubricant ; any boiled vegetable or animal oil is inferior ; so is tar. And even if the oil was only heated to a temperature considerably below its boiling-point, the lubricating qualities are much impaired.

" 9. It must not be too thin ; but thick, adhesive, and stick to the parts, not being removed by mere friction.

" 10. It must not be too thick, like tallow or frozen sperm-oil, as those substances will not penetrate to the parts to be lubricated. Even the boasted Mecca oil was found defective in this respect at the Brooklyn navy yard, as it was too thick to penetrate between the axles and journals when the pressure on

them was considerable; however, for some heated parts of machinery, as the cylinders of steam-engines, tallow or a thicker oil may be preferable; and in general the oils should be adapted to the machinery on which they are to be used; and even different parts of the same machine should be lubricated with a different oil, each oil adapted to the functions the part has to perform.

"This summary of the requisites of a good lubricator is, in fact, a criticism on the existing oils used for this purpose; it shows that none are perfect, and that there is great room for improvement."

Cost and Waste of Steam-Power.

SOME abuses have gone so long unchecked that they seem to have become established customs. This remark applies with special significance to the cost and waste of steam-power. For the last quarter of a century, it has been known that steam worked expansively was more economical, all things being equal, than when otherwise applied. The widest notoriety and most extended publicity have been given to this fact; it has been controverted, reaffirmed, and finally established past all cavil or quibble as an axiom in the minds of engineers, and it might be supposed in the minds of men interested in the subject. But this is not so. When a manufacturer needs a steam engine, he does not, as a rule, seek for the most economical one, but he wants one for the lowest possible first cost, regardless of future outlay.

An engineer hearing of a customer, goes to him and says, "I have an engine which I will guarantee to produce a horse-power for a certain number of pounds of coal per hour, and the price is so much." Another engineer says, "I have an engine which I will sell you for twenty-five per cent less." He guarantees nothing, but in nine cases out of ten the lowest price secures the order, without regard to intrinsic value or immediate economy. If this practice, so discouraging to professional engineers, who like to see their labors appreciated, was peculiar only to small establishments, it would be a serious evil; but men who use hundreds of horse-power, and pay city prices for the coal to produce it, are equally indifferent to their interests.

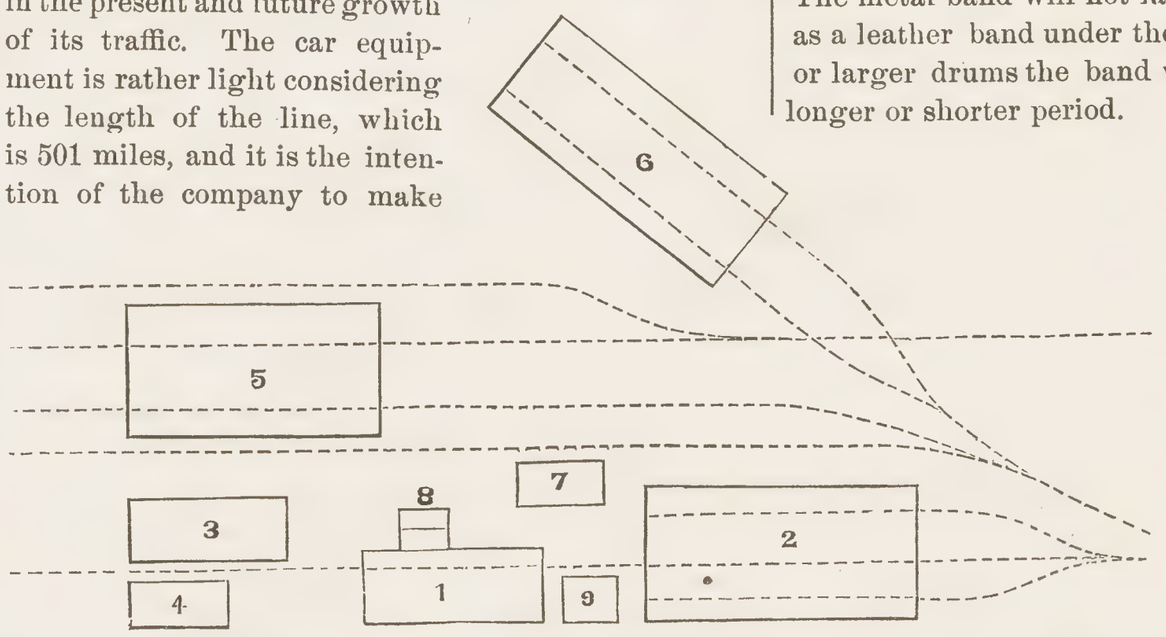
A simple elementary calculation will show any non-professional man the difference between steam-engines of the same pattern and plan; one working steam expansively, the other non-expansively. Through instruments familiar to the engineering profession, and not through hobbies or theories of any individual, it is possible to state exactly what power an engine is exerting, and how much it costs to produce that power. As a rule, an engine working non-expansively consumes six pounds of coal and upward per hour for each horse-power. An engine working expansively, and properly applied to its work, will produce a horse-power for less than two pounds of coal an hour. Now, by observing what the market value of fuel is, any one can tell whether he is throwing away money or not. What difference does it make whether money is in the shape of coal or greenbacks, so long as it goes into a steam-boiler? It would look odd to see a fireman supplied with $3 to $6 a day by his employer, and told to throw it into the furnace; yet this is what he is actually doing when he burns half as much again coal as his work requires. No one compels a manufacturer to do this; nor is he taxed by law according to the power he employs; he taxes himself and keeps on depleting his pocket after he has been told of his loss, because he is unwilling to pay the market value of improvements to persons who have spent their lives in perfecting them.

If these statements applied only to a certain form of engine, made by certain persons, we might be suspected of motives not altogether disinterested. But engines working steam expansively and non-expansively, are usually made by the same parties, who will furnish either kind as they are needed, and the manufacturers know perfectly well which is the most economical. The fee-simple of a coal-mine would enable many persons to run their engines at comparatively slight expense; but even when they don't enjoy this privilege, they are just as willing to pay heavy bills for fuel through their unwillingness to learn.—*N. Y. Sun.*

Houston and Texas Central.

A TEXAS correspondent sends us the annexed diagram showing the general plan and dimensions of the shops of this road, now nearly completed, and located about a mile from the central part of the city of Houston. The new car-shops, and some additional buildings for the locomotive department, were commenced about a year ago, and when finished will be second to none in the South for convenience and the rapid and economical turning out of work. The structures are mostly of brick, and are already fitted up with the best iron and wood-working machinery to be procured at the North, as well as many special mechanical arrangements devised by those connected with the shops. One of these is perhaps worthy of mention. It consists of an elevated tramway for transporting material to and from the planing, boring, and mortising machines in the wood-working department. A grooved wheel runs upon the track, and the timber is carried in clamp-hooks suspended by a differential pulley. This method saves the labor of one, and sometimes of two men.

These facilities for the construction and repair of rolling-stock will be of great advantage to the road in the present and future growth of its traffic. The car equipment is rather light considering the length of the line, which is 501 miles, and it is the intention of the company to make some considerable additions thereto during the current year. At present there are only 1147 cars of all classes, and of these only about 70 are passenger-train cars. The Houston shops have just turned out two new combination baggage and mail cars, which are fine specimens of their kind, and embody some desirable improvements which render the distribution of the mails more expeditious and easy. The introduction of machinery for car construction has been comparatively recent here, and its advantages over hand-labor are sufficiently apparent by the quantity of work done since it has been brought into requisition. The piles of miscellaneous rubbish and fragments of car-stock, which had accumulated on the premises during past years, are gradually disappearing by being utilized in one way or another, under the direction of the present master car-builder. A swing-beam truck is to be adopted in place of the rigid ones heretofore in use. The brakes on all freight-cars are hung to the trucks between the wheels.



	Feet.		Feet.
1. Machine-Shop	52 × 112	6. Paint-Shop	70 × 165
2. Passenger-Car Shop	80 × 180	7. Store-House	20 × 50
3. Lumber-Shed	30 × 120	8. Boiler and Engine	20 × 20
4. Blacksmith-Shop	30 × 75	9. Office	30 × 30
5. Freight-Repair Shop	60 × 180		

It was only a year or so ago that a division was made in the mechanical departments, the experiment being quite a new thing in Southern railway practice, but it has worked well upon this road, and there is little danger of a return to the former method. The locomotive shops are of the usual kind, and in near proximity to the car department. As there is no outside market for scrap in this region, there is a furnace in the shops for working it up as far as it can be made useful. A new round-house, containing 28 stalls, is to be built this season. The company now have 67 engines in service on the road. The Southern and Western Divisions have a 5 ft. 6 in. gauge, while the other portion of the line is 4 ft. 8½. This disadvantage will not be of long continuance, as preparations are being made to have the gauge of uniform standard width, and the trucks and engines are to be narrowed as fast as they come in for repairs.

Mr. L. C. Noble is the master mechanic, and Mr. James McGee the master car-builder. The hours of labor were recently increased from nine to ten, which was quite unexpected, and is a favorable indication of the anticipated improvement in business.

Metal Belting.

A CORRESPONDENT of the *American Artisan* makes the following objections to the practical working of steel belts as recommended in a paper by John W. Sutton, published in our March number:

"I do not believe that metal bands can ever be employed successfully for the transmission of power. A soft steel band $\frac{1}{24}$ of an inch thick, running over a drum 36 inches in diameter, the latter revolving 350 times per minute, will last from 80 to 100 days, when it will break. After splicing it will run from about 5 to 8 days, when it will break again; but at this time it will show several more cracks, and perhaps be found to be already breaking in two or three places. The metal band will not last one fiftieth part as long as a leather band under these conditions. On smaller or larger drums the band will last a correspondingly longer or shorter period.

"The band-saw blades to which Mr. Sutton refers act also in the same manner. Many an apparently sound saw-blade from $\frac{1}{4}$ to $\frac{1}{2}$ inch in width breaks every day or oftener, which it did not do when first put on. It has become brittle on account of the great number of times it has been bent. It is, in fact, what we call worn out. By using a band-saw when new, the blade being from $\frac{1}{4}$ to $\frac{1}{2}$ inch in width, it can be used up to $\frac{1}{3}$ or within $\frac{1}{16}$ of an inch without breaking.

"According to a statement from a good author, metal bands also stretch—and very much too. Some were well tried about twelve years ago. Another objection, in many if not all cases, is the expansion and contraction resulting from differences in temperature, the band being at one time so tight that it would break, and at other times so long as to slip. This, however, could probably be obviated by a tightening pulley; but the use of this pulley would in many cases be very inconvenient."

A REFRIGERATOR-CAR has just been made at the New-Haven car-shops on the plan of Allegretti's "iceberg car." The interior of the car is lined to the thickness of an inch with heavy hair felt, over which is another lining of tarred paper. This being inclosed with boards, a space is left of about five inches for the reception of the ice, which is placed here through holes at the top. The whole is sheathed at the bottom, at the sides, and overhead with galvanized iron, and shelves are arranged for the reception of fruit, for the transportation of which the car was especially designed. Hot air is ejected from the car through small pipes at the top, and the water of the melted ice is drawn off in a manner equally ingenious. The car is to be first used in bringing strawberries from the South.

Automatic Signal and Gate System.

A CORRESPONDENT of the New-York *Tribune* says: "The Philadelphia, Wilmington and Baltimore Railroad Company has recently put down, on trial, on three miles of its road, a new railway signal and gate system, by which it is proposed to render impossible collisions on railroads and accidents to persons and vehicles traveling on roads and streets crossed by them. The force used in operating it is compressed air. Along or between the tracks, or under the road, is laid a continuous iron pipe two inches in diameter, in which are compressed from six to ten atmospheres. Seven atmospheres give a power of over eighty-five pounds to the square inch. This pressure is maintained in the pipes by air-pumps stationed every twenty or thirty miles along the road and worked by steam-engines, or by water-power when it is found. When the train moves out of the depot the locomotive strikes a small depending lever or "commutator," so arranged that the locomotive can not pass without striking it, and in an instant, at the first street which the track crosses, a gong or bell is set ringing to warn persons that a train is approaching, and a gate extending across the street descends to within two feet of the ground. This gate is composed of a light bar from which hang ropes or strips of leather five feet long, and so close together as to present the appearance of an impassable barrier shut across the entire street. It is painted white, and across it, in red letters four feet high, is the word 'Stop!' The object of making the gate of this material, instead of a solid frame-work, is to secure lightness and to prevent its injuring a horse or person passing under it at the moment it begins to descend. The gate remains closed until the train has passed. On passing the first street, the locomotive strikes another commutator, and instantly another bell is rung, and another gate a square ahead is closed, and by the same movement of the commutator, the gate which is passed is caused to rise to its place, and the crossing is left free. In this manner every train that passes through a city is made automatically to fence itself in, as it were, by closing and opening gates over each street, one or ten squares in advance, as may be desired.

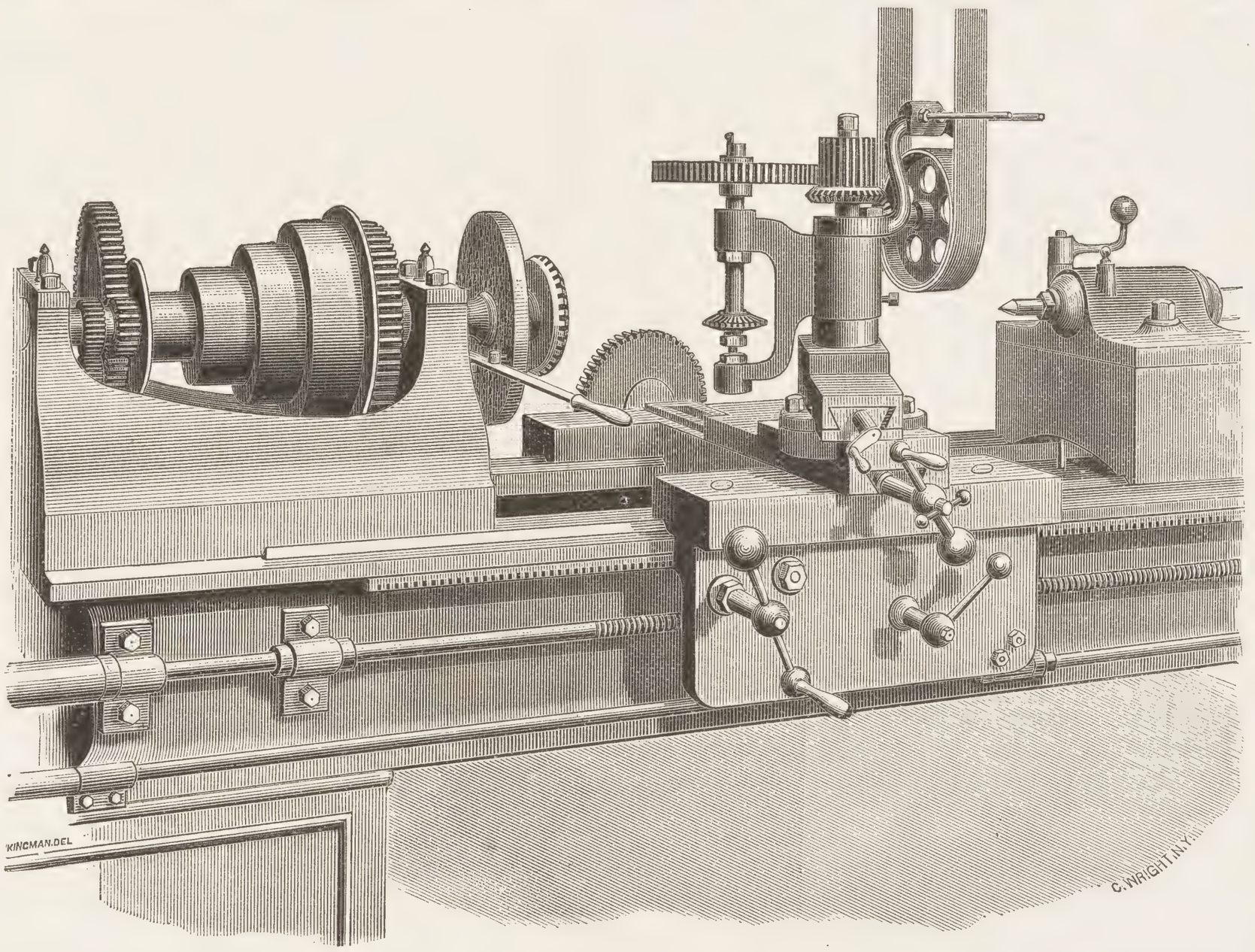
"When the train starts, by its striking the lever already described, a danger-signal is instantly thrown around at right angles to the track behind the train and another a mile ahead of it. When this one is reached another lever is struck, and the last-mentioned signals are thrown back to their former positions, showing the first mile to be clear, and two other signals, one behind and one a mile ahead of the train, are exposed; and so from mile to mile along the whole road. At every point of its progress a train is thus between two signals, one to warn trains coming toward it; the other, trains following it."

THE railroad shops at St. Albans, Vt., which have been running on reduced time, have started up on full time.

Steam Hill-Climber.

A NEW locomotive has been constructed for use on Ithaca Hill, N. Y. The incline has five tracks, the two outer being of the usual width, used in the ordinary manner. When the engine starts up the hill, it rests upon a pair of rails just within the usual track and upon a set of double-flanged small driving-wheels which are upon the same axles with the big drivers—they being only about 30 inches in diameter; this inside track is raised about 15 to 18 inches above the outer one, and high enough so that the big drivers do not touch the track at all; the engine rests now upon the small drivers, and is independent of the outer ones; then in the centre of the track is placed a wide cogged rail, which exactly meshes into the cog-wheel which is between these small drivers, directly under the centre of the locomotive. By applying power to the big drivers, in the ordinary way, the power is applied to the cogged wheel, which does the climbing. The cogs are about 3 in. from tip to tip, and the wheel is 8 in. wide.

THE Indianapolis Car Company has been reorganized under the name of "The Atlas Works."



Gear-Cutting Attachment for Lathes.

THE engraving illustrates a lathe with a gear-cutting attachment. This fixture can be attached to a common lathe, as a substitute for, and therefore dispensing with, an expensive gear-cutting engine for cutting spur and bevel gears. It consists of a cutter fixed on an adjustable spindle which also carries a gear that meshes into a carrying-gear driven by bevel gears, one of which is on the driving-shaft carried by a driving-pulley, the carrying-gear and pulley partially rotating around the clamping-screw post, the whole being set in a proper frame-work and clamped to the tool-carriage of the lathe. The index-plate is made the full diameter of the swing of the lathe, and is held in position by a simple and substantial lever, the plate being made fast to the face-plate of the lathe, and drilled in a suitable manner for all ordinary pitches.

These attachments are manufactured and patented by the New-York Steam-Engine Company (98 Chambers Street), and are made to fit their own lathes unless otherwise ordered. The sizes are adapted to swing-lathes ranging from 20 to 50 inches.

A RAILROAD was to be sold at sheriff's sale in Iowa, and a friendly agreement was made by which the model sheriff was to receive $350 in payment for his part of the transaction, which required two hours of his valuable time. But after the sale, he happened to look at the statute which fixed his fees, when he found to his horror that he had been transgressing the laws of the State, which declared that he should receive no other fees than those legally assigned him, and said he would take nothing but his lawful fees, which, in this instance, amounted to $11,000. The railroad men endeavored to hold him to his original bargain, but he was too conscientious to violate the laws he was appointed to uphold, and the case going to the courts, his integrity was rewarded by a verdict in his favor.

THE Chicago and North-western Railroad Company has just made contracts for the erection of the following additional buildings at the car-shops at Cicero: Shop for blacksmith-work and iron-working machinery, 80 x 300. One building for wood-working machinery, two stories high, 80 x 300. Two erecting shops, 80 x 300 each. One paint-shop, 80 x 300. One stove-house, 50 x 300. One boiler-shop, 80 x 30. One oil-house, 40 x 50. It is also contemplated to build a foundry as soon as possible. A number of transfer-tables will also be erected. The cost of these improvements is estimated at $250,000. With these new additions the North-western car-shops will be the finest and most extensive in the country.

THE largest and most powerful locomotive on the Pennsylvania Railroad is the Modoc, which draws with apparent ease 100 empty cars from Columbia to Harrisburg—double the number averaged by the engines running between these points. Eastward she pulls from 70 to 80 loaded cars as easily as a locomotive ordinarily manages half the number. As the length of a car is 33 feet, the Modoc's train westward is 3300 feet long—nearly two thirds of a mile.

THE project of a tunnel under Newark Bay is being discussed, to supersede the long pile bridge of the Central Railroad. The constant decay of this structure necessitates the practical rebuilding of it once in five or six years. The repairs already amount to three times its original cost. The cost of a double-track tunnel is estimated at $6,000,000, and would last a century.

ORDERS have been received at the shops of the Pennsylvania Railroad Company, in Altoona, for several new cars, to be denominated "Centennial Passenger-cars," and it is also stated that a number of new locomotives are to be built.

ALL the State railroads of Prussia and several others have introduced uniform colors for tickets of the different classes, which are to correspond with the color of the cars. They are yellow for first class, gray for second, and brown for third-class.

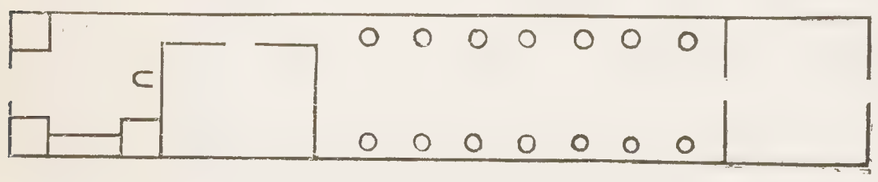
Car-Shop Notes.

THE BARNEY & SMITH MANUFACTURING COMPANY, DAYTON, OHIO.

THIS company is now engaged in executing a number of contracts for freight and passenger cars. Some of these are for the Painesville and Youngstown, and the West End, of St. Louis, narrow-gauge roads, and include passenger, box, and flat cars. As a specimen of the first-named class, there is one 35 x 8, with a seating capacity for forty-four persons; the interior is handsomely furnished in black-walnut and Hungarian ash, and the seats upholstered with crimson and green plush. The car is equipped with Miller platforms, and costs about $3200. An ordinary standard-gauge car of the same style of construction costs about $4800. Another specimen of this class consists of a combination baggage, mail, and express car, with a passage-way along one side connecting with the three compartments—painted wine color, with monitor roof and Miller platforms. Another is a narrow-gauge ladies car—the gauge referring to the car and not to the ladies—35 feet long, with roof and platforms as above, and finished throughout in a style of superior workmanship. The lights in doors and roof are ground glass, the upholstery crimson and green, the inside finish black-walnut, with centre-lamps, mirrors, a silver-plated alcove for water, etc. The ordinary basket-racks are dispensed with, their place being supplied with fire-gilt hooks attached to the frieze. The seats are a little lower than usual, and this, with a concavity in the roof, affords greater space between. Another peculiarity in the arrangement of the seats is, that they are so placed that the sitter can have an arm-rest upon the window-sill, which is not always the case in narrow-gauge cars. This car is named "Theresa."

In addition to the above, we may mention a narrow-gauge box-car, which may almost be considered a standard pattern with respect to dimensions and construction. It is 23 ft. 3 in. long by 7 ft. 2 in. wide; height from track to sill, 2 ft.; height from track to top of roof, 8 ft. 4 in.; height of draw-bar, 2 ft. 3 in.; inside height from sill to plate, 5 ft. 9 in.; weight of body, 5340 lbs.; weight of trucks, 4270 lbs. Total cost, about two thirds that of an ordinary box-car. Another pattern still, is a combination smoking and baggage car for the St. Louis West End narrow-gauge-road.

The company is also engaged on a number of orders from standard-gauge roads, and has just turned out a complete train of baggage, passenger, and express cars for the Logansport and Terre Haute; also 40 menagerie cars for the United States Rolling-Stock Company, and labelled "Howe's London Circus, and Sanger's English Menagerie." In appearance they resemble ordinary stock-cars somewhat, but are really cages mounted on wheels. Two very beautiful parlor-cars have just been completed for the Terre Haute and Indianapolis Railroad. They are duplicates in every respect. Their interior arrangement is indicated by the diagram. At the end on the right is a smoking-room with seats upholstered in scarlet plush. The



central saloon has fourteen revolving chairs upholstered in the same style. Next to this is a private parlor with seating capacity for eight persons and opening upon a side-passage, the intervening space between this and the opposite end of the car being occupied with a linen locker, wash-stand, water-closet, and Baker heater. The floors are laid with black and gold Turkey carpeting; the cabinet-work is in black-walnut with gilt tracery, supplemented with handsome mirrors bordered with embossed glass and set in richly carved frames, also fire-gilt centre lamps, with brackets of the same material. The general effect is heightened by a profusion of tasteful and artistically carved embellishment, the work of the special artists connected with the establishment. The cars are designed in every detail and particular solely by the builders, the road giving them a *carte blanche*.

There are also in progress eight sleepers, 55 feet long, for the Central Pacific. The order was received but a short time ago, and already three of them are in the paint-shop, and the others are well under way. A palace chair-car is also building for the same road. All are provided with Miller platforms and mounted on six-wheeled trucks, and will be painted a yellow gold color, which is the standard color adopted by the road. Two Wagner palace-cars are also under way, and will run between Cincinnati and Sandusky over the C. S. & C. and C. C. C. & I. roads to accommodate summer travel to Put-in-Bay Island. They are 56 feet long; the inside work, including doors, windows, etc., is mahogany relieved with ebony. The windows are 36 x 54, and are furnished with cornices, lambrequins, and curtains. Other ornamental accessories combine to give to the car an exceedingly rich and sumptuous appearance. They have six-wheel trucks. Six passenger and four baggage cars, belonging to the U. S. Rolling-Stock Company, are also being rebuilt and made as good as new. A fine passenger-car has been completed recently for the Fort Wayne, Muncie and Cincinnati road.

In the Agricultural department of the works, an order is being filled for 500 wheat-drills and 200 horse-rakes. A sand-papering machine is used in the wood-shop for smoothing and sizing tenons so as to insure perfect accuracy in framing.

These works rank among the oldest and most extensive of the kind in the country, and employ a force of 1000 men when running to their full capacity, which is equal to 15 freight-cars and 160 car-wheels per day, and 10 passenger and baggage cars per month. About 400 men are now employed in the car department. A contract is in hand for 500 box-cars for the St. Louis, Kansas City and Northern, to be delivered in May, June, and July, which will increase the present force to double the number.

Since writing the above, we learn that additional contracts have been made by the company for the building of eight passenger and two sleeping cars.

The New Shops of the Pennsylvania Railroad, near Jersey City.

SINCE the Pennsylvania Railroad Company came into possession of the lines of road which now constitute its New-Jersey Divisions, it has projected and pushed forward to completion many much-needed terminal improvements in the vicinity of this city. At Jersey City, the new passenger stations and improved ferry-house accommodations are a credit to the road and a very great convenience to the public, while the facilities for freight transfer by means of new wharves, warehouses, and additional tracks, are ample for the requirements of future business.

Not the least important of the enterprises looking to the growth of traffic and the necessity of increased facilities to meet it, are the extensive shops which have just been completed at the "Meadows," so-called, about midway on the line between Jersey City and Newark. A more unpromising site for such substantial structures could hardly be imagined, the ground being boggy and marshy to an extent which made the locality unfit for building purposes, and still more so for healthy habitation. These obstacles, however, have by perseverance been overcome. A vast amount of preliminary labor was expended in preparing a suitable foundation, by driving piles to a great depth, and by extensive filling-in with solid earth for the laying of tracks, etc. The shops and their accessories cover many acres, and constitute a feature in the desolate "Meadows" which would be a surprise to our ancestors of the olden time.

The buildings are all of brick, and have slated roofs. The most conspicuous are the round-house for locomotives and the shop for the construction and repair of freight-cars. The former is one of the largest in the country, being 300 feet in diameter, with three entrance tracks, and containing 41 stalls. The freight-car shop, as far as completed, is in the form of a semicircle, the original design being to make it a round-house. Its diameter when finished will be 430 feet; it will contain about 40 tracks. The portion already constructed is in full operation; the work done is repairing exclusively. Next to this is the passenger-car shop, 402 x 137, a well-lighted, well-ventilated building, and every way suited to the construction, repair, and painting of this class of cars. The only work done at present is repairing.

Next to this, and separated from it by a transfer-table, are the machine, boiler, and locomotive erecting shops, connected so as to form the three sides of a square, but consisting of three buildings, each 200 x 175 feet. The erecting, and also the boiler-shop, communicate with the transfer-table by numerous tracks. The pit in which the table runs is 480 x 60 feet, the power used being an upright boiler with double-cylinder engine attached to and riding upon the table. The machinery in the locomotive department is of the latest and most improved description. The wood-working shop is capacious, well lighted, and contains the most approved machinery in use for this purpose. The blacksmith shop has 50 fires, with large and small hammers and furnaces.

There are also several other buildings of minor importance, including a fire-proof structure for paints and oils, an iron house, a drying-house for lumber, a lumber-shed, office, etc. Contiguous to the wood-working and machine-shops is the engine-house which supplies the main power. The engine is 300 horse-power. There are six boilers, 18 feet long and 5 in diameter. The stack is 125 feet high, and rests upon masonry sustained by oak piles driven 65 feet into the ground.

A great deal remains to be done to improve the surroundings, by drainage, filling-in, and track laying. This work is steadily progressing, and this portion of the "Meadows" will soon be so transformed as to leave no trace of its primitive condition. Dwellings will in due time be erected for the workmen, and the foundation fairly laid for a healthy and thriving town.

Mr. Louis A. Bosdevex is the master mechanic in charge of the locomotive department, and Mr. E. Lockwood is the superintendent of car repairs. The works, when running to their full capacity, employ a force of 800 hands; at present there are probably but little more than half that number employed.

American vs. English Railway Practice.

A CORRESPONDENT of the London *Times* commenting on the recent fatal railway accident at Shipton, takes occasion to show why it is that such an accident could not have occurred on an American road. He says, very truly:

"1. If the solid cast wheel of America had been used, instead of the compound steel-tired English wheel, the break could not, probably, have occurred.

"2. The break having occurred, if there had been cord and bell communication, as in America, the occupants of the fated carriage could have communicated with the engine-driver and had the train stopped.

"3. If they had had air-brakes, as in America, the engine-driver might still have stopped the train after he became aware of the trouble, before the fatal leap.

"4. If they had used the American coupling, instead of the heavy English chain fastenings, the accident might, at most, have been limited to one carriage."

The writer continues:

"We are not, unfortunately, exempt from railway accidents in America. The number is greater, perhaps, than here, but they occur from other causes, well understood. For example, many roads have but single tracks, giving greater liability to collision. They often pass through forests, where trees are blown on

the tracks by storms; the heavier rains and freshets of that country more often disturb bridges, culverts, etc. As the tracks are not inclosed, live-stock, running at large, often obstruct the way. Being a rougher country, there are more cuts and 'fills,' and consequent danger of land-slips, falling rocks, yielding trestles, etc. These, and such like causes, must excuse to some extent the frequency of American railway accidents; but the superiority of their rolling-stock, appliances, and management doubtless prevents and avoids many such fatal disasters as that which has just occurred at Shipton, and which, probably, would not have occurred if American appliances had been used."

A Railway in the Balearic Islands.

A LETTER from Majorca to the London *Times* gives an account of the opening of the first railway in that island, and speaking of the starting of the first train, it says:

The religious ceremony over, the priests and gentlemen took their seats, many of them for the first time in a railway carriage. "But why are all these priests going?" innocently asked one of the bystanders, who had not been invited. "They are going to give absolution to the killed and wounded," replied his neighbor. "And the doctors, too, why are they going?" "Ah! they go to cure the maimed," was the reply. "I don't believe it will go without mules," exclaimed a countryman, in jacket and blue calico Moorish drawers. "How should it?" said his companion, a handsome, dark-eyed girl, probably his daughter, "don't we put fire on our hearths all the winter nights, and did any of us see the kitchen start off? I don't believe in it a bit." "They won't take me in with their smoke," said another countryman. "We have none of us been allowed to go near the train. What will you bet that the mules are not concealed between the wheels?" Amid these commentaries, the last shriek of the engine mingled with the strains from the band of music stationed on the platform, and at 9.41 the train started. Nothing could be more agreeable than the trip across the pleasant country. The morning, although the weather had been cold and rainy for the previous days, was bright and sunny. The fields were covered with the vegetation of early spring, and the verdure of the ground crops formed a delicious carpet to the thousands of almond-trees now in full blossom just before their budding leaf appears, while the reflection of the sun on the mountains, capped with the unmelted snow which had fallen during the late storm, formed a charming background to the landscape. All along the line the villagers stood in crowds to see what a real railway train in actual motion was like, for up to February, 1875, they had not a notion. More than one yoke of mules, which their too curious drivers had brought up in close proximity to the line of railway, started off at full gallop when they had their peep at the unknown monster now first appearing among them.

The Side-Framing of Freight-Cars.

THE drawings represent three models of the side-framing of freight-cars, selected from a large number sent to the Car-Builders' Association Rooms previous to the monthly meeting held on the 18th of March. These models were constructed of yellow pine on a scale of 1½ inches to a foot, and corresponding in all respects so nearly to the actual frame of the car that the tests to which they were subjected would indicate their comparative strength. These tests consisted of a vertical strain applied to the central portion of the sills and measured by platform scales. The results were doubtless approximately correct in most cases, although the faulty construction of some of the models in the matter of tie-rods and their fastenings prevented a fair test of the maximum power of resistance. We append the following record of the tests applied to the models represented in the drawings:

Fig. 1. Model sent by Central Vermont Railroad. Length of car, 35 ft.; centre to centre of bolsters, 25 ft.; sill, 8 x 4¾; plate, 5½ x 3. A pressure of 1050 lbs. produced a deflection of $\frac{5}{16}$ of an inch without serious damage to the model, the plate seeming to be the weakest part under maximum strain. Weight of model, 2 lbs. 12 oz.

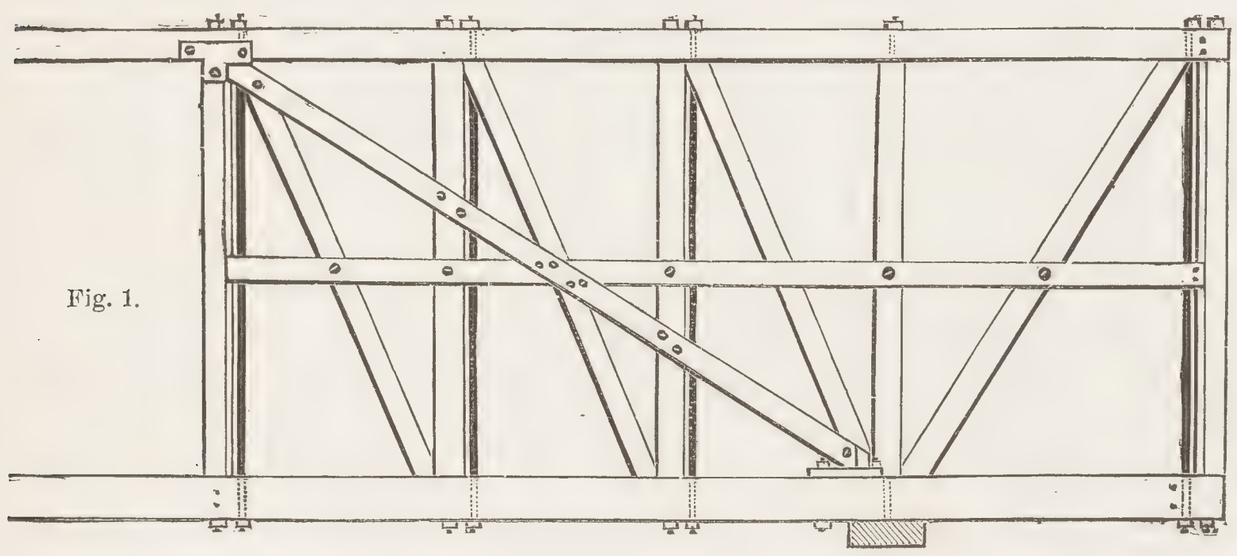


Fig. 1.

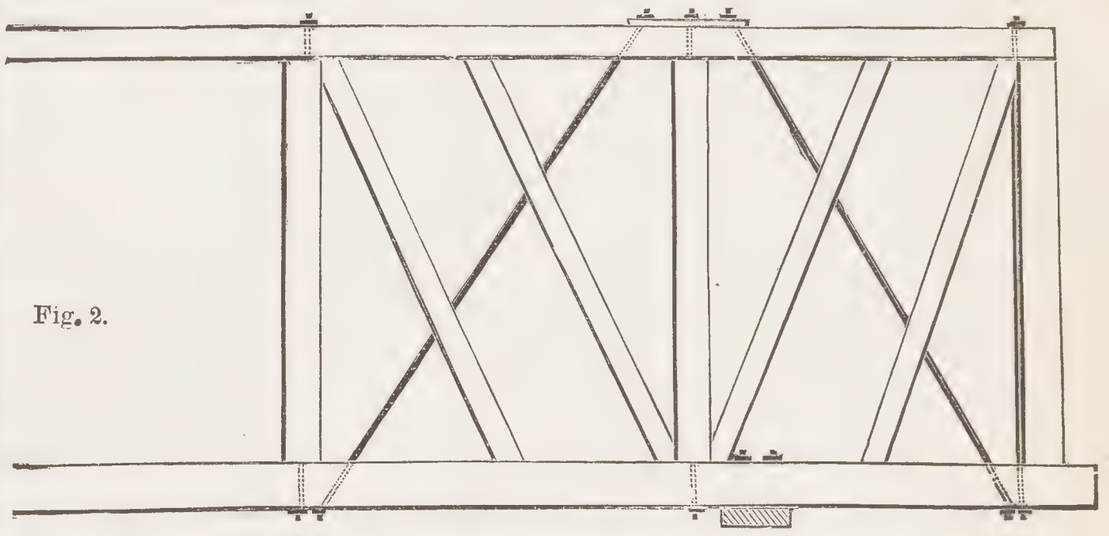


Fig. 2.

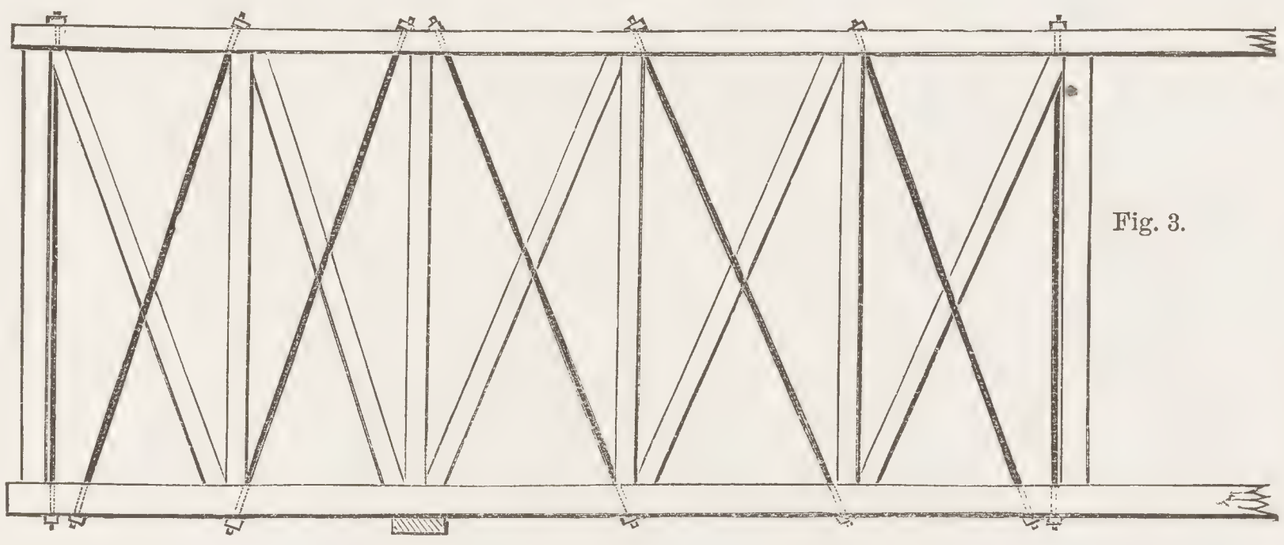


Fig. 3.

Fig. 2. Model sent by Cleveland, Columbus, Cincinnati and Indianapolis Railroad. Length of car, 28 ft.; centre to centre of bolsters, 19 ft.; size of sill, 7 x 4; size of plate, 5½ x 3. A pressure of 500 lbs. produced a deflection of $\frac{3}{16}$ of an inch, but before reaching a strain of 600 lbs. two bolt-heads pulled off and the model was somewhat out of shape. Had the bolt-heads been put on with beveled washers, the model would have stood 200 lbs. more strain quite easily. Weight of model, 2 lbs. The car of this style and size weighs 16,300 lbs.

Fig. 3. Model furnished by Boston and Albany Railroad. Length of car, 35 ft.; distance from centre to centre of bolsters, 24 ft.; sill, 8½ x 4½ inches; plate, 5½ x 2¾ inches. A pressure of 1000 lbs. produced a deflection of $\frac{11}{32}$ of an inch, but before 1050 lbs. was reached a truss-rod broke. The weight of model is 2 lbs. 8½ oz.

THE heaviest stock-train that ever passed over the Central Pacific Railroad went through recently. It consisted of thirty-five car-loads of stock from Eastern Nevada.

ON four of the railways ending in London there are in use 5563 locomotives, 13,587 passenger-cars, and 170,404 freight-cars.

The Hudson River Tunnel.

WORK has already begun on the tunnel which is to connect New-York and Jersey City. It will be 24 feet high and 26 feet wide, inside measurement. At the water-edge on the New-Jersey shore it is to be about 35 feet below the surface, and at the point where it will strike the New-York City shore it will be 45 feet below. When it shall have been finished it is to be fitted up with double tracks, and trains will run at regular intervals for the accommodation of passengers. Flat-cars are to be provided for the accommodation of horses and wagons and other vehicles, and much of the freight from the great railway companies who own the shore front will be transported through it. Its walls are to be of brick, and will be three feet in thickness. When the river shall have been reached it is proposed to carry it on to completion by the construction of what, in tunnel architecture, are known as "locks,"—air-tight passages, in which the pressure of the air will be sufficient to resist the pressure from the outside until the walls shall have been completed. The excavation is to be accomplished through the agency of an air-tight tube. The pressure of the air is expected to remove the earth from the tunnel with the rapidity with which fifteen men could shovel it into cars, and it is to be carried by the same natural agent through a tube to the surface, thus saving the expense of laborers and of transportation upon cars.

Solid and Hollow Iron Columns.

WE find the following in an exchange: "The quantity of iron in solid columns of strength and height necessary for carrying the floors of ordinary warehouses and workshops is fully 50 per cent greater than that which would suffice to cast hollow columns of similar strength and height. Thus a solid column of cast-iron, four inches in diameter, weighing 40 pounds per lineal foot, has only the same amount of strength as a hollow column 5 inches in external diameter and 1.16 inches in thickness, weighing 29 pounds per lineal foot, when the height is 9 feet; and a solid column 12 feet in height, 7 inches in diameter, weighing 122.4 pounds per lineal foot, is only of equal strength with a hollow column of similar height, having an external diameter of 9 inches, a thickness of one inch, and weighing 80 pounds per lineal foot. The late Eaton Hodgkinson ascertained that within certain limits the strength of columns is as the 3.6th power of the diameter in inches, and universally as the 1.7th power of the length or height of the column. The formula for calculating the strength of the columns of cast-iron, both solid and hollow, and of any proportion of length to diameter, is given in the second part of Tredgold's 'Practical Essay on the Strength of Cast-Iron and other Metals.'"

THE quantity of iron to be used in the construction of the Centennial buildings will aggregate about six thousand tons, of which more than five sixths will be wrought.

Wheel and Rail Surfaces in Contact.

To the Editor of The National Car-Builder:

DEAR SIR: As every suggestion which has any relation to economy in railroad operation is valuable in times like these, I wish to call attention to the proportions of rail and wheel surfaces which come in contact in ordinary practice. The face or tread of the wheel, in order to allow for lateral play and spreading of the track, must necessarily be much wider than the rail, but owing to the narrowness of the top of the rails in general use, the surface in contact with the wheel bears no proportion to the width of the tread or face of the wheel. The consequence is that the latter, after running for a time, becomes grooved, and the life of the wheel is thus materially shortened. Now, would not a wider rail, or a rail with more contact-surface, be better for the wheels in many respects? If the increased width, in order to secure more bearing surface, involved a heavier rail, would not the increased weight be more than offset by the greater durability of the wheels? An increase of weight, however, is not necessary to a flat-top rail unless the width is increased to 2¾ or 3 inches, which might be considered excessive.

I am of opinion that more rail-surface would be a decided advantage in the operation of our railways; and, in order to support this view, I will state that the Michigan Central road, during a period of several years subsequent to 1858, used a 3-inch rail of the flat-top pattern, with a bearing-surface of full 2¼ inches. It was well laid, and made a much smoother track than the ordinary 2¼ rail with a 1½-inch bearing. The engines had a better adhesion, drew heavier trains, and the tires showed a better mileage before turning. Those were the days of iron tires. The wear of tender and truck wheels was more uniform on the tread, and as a rule the wheels did not slip so easily under the application of the brake. The advantage was clearly manifest so long as the road stock was mainly run on the line; but when foreign stock was introduced, with wheels worn and grooved by running on the ordinary T rail, the narrow, unworn edge of the wheels coming in contact with the outside edge of the flat rail, rapidly wore away both wheels and rail. It was also noted that the percentage of broken wheels under foreign cars increased somewhat, while such percentage of Michigan Central car-wheel breakage was reduced. This pattern of rail, however, did not prove to be very durable on account of the lamination and separation of the head from the web. This was doubtless due as much to the imperfect manufacture, as to the peculiarity of the pattern. A 2½-inch flat-headed rail can be made of such proportions as not to weigh over sixty-five or sixty-seven pounds per yard, while a good pattern of 3-inch flat-head ought not to exceed seventy-five pounds to the yard.

The following table shows the results of some experiments made by Mr. O. Chanute, ten years ago, by jacking up the engine-wheels and inserting between them and the rails a sheet of thin tissue-paper underlaid by black manifold copying-paper:

Diameter of driver.	Weight on driver.	Position of wheel.	Condition of wheel.	General size of Impression.	Area in contact.	Pressure per square inch.
ft. in.	lbs.			inches.	inch.	lbs.
5 0	11,175	Right.	Worn.	7-16×¼	0.13	85,961
5 0	11,175	Left.	Much worn.	2×3-16	0.42	26,607
4 7¼	11,358	Right.	Newly turned.	¾×⅜	0.32	35,494
4 7¼	11.358	Left.	Newly turned.	7-16×⅜	0.14	81,128
5 0	11,912	Right.	Partly worn.	¾×7-16	0.36	33,089
5 0	11,912	Left.	Partly worn.	¾×⅛	0.35	34,034
5 0	11,185	Right.	Partly worn.	¾×⅜	0.32	34,953

The rail was the old Erie pattern, with 2¼-inch head and 1½-inch flat or slightly crowned surface. The most favorable of these results is the one in which the old tire had worn down to fit over the full head of the rail; but in the case of new tires the bearing-surface is reduced to a very sharp line. No rail or tire of steel or iron can long withstand a wearing strain of 81,000 or even 26,000 lbs. to the square inch; but by widening the rail, the requisite increase of wearing-surface is secured.

The new rail-pattern adopted by the Erie road, and about to be introduced upon other leading lines, has an increased width of head, and will doubtless lead ultimately to the use of a still wider head. Meantime, the book engineers are busy with their delineations and scientific forms, and the rolling-mill owners are grumbling at the difficulty of making rails to pattern. I can not but side with the latter, when an inspection of the new Erie rail discloses the fact that the angles at the junction of the head and base with the web are not alike, one being about 15° while the other is only 12°. There is no obvious reason why there should be this difference, but a manifest advantage in having the angles the same at top and bottom. The fish-plates, especially the plain ones, would not be liable to be put on wrong side up, and so have an imperfect bearing above and below.

I merely submit these suggestions as worthy of the attention of the master mechanics and car-builders who are about to hold their annual conventions for the discussion of subjects of this kind. M. M.

Defects in the Construction of Cars.

MR. REUBEN WELLS, the master-mechanic of the Jeffersonville, Madison and Indianapolis Railroad, in a communication published in the *Railroad Gazette*, refers as follows to existing defects in the construction of cars:

"Another matter for investigation is the system and style of cars used for freighting. How can their durability be increased to such an extent that the additional cost of construction will still result in economy over the cost of the present style? In some particulars the common freight-car is notoriously unworthy of the mechanical knowledge and judgment of railway managers—chiefest, perhaps, in the springs that carry the body. The body is carried on four points, while the *available* motion (vertical) of those bearings (springs) for carrying the body of the car without *twisting* it to conform to the vertical inequalities of the track, does not exceed one eighth of an inch ordinarily; consequently, the body must conform to the line of the top of the rails immediately under each of the four bearings by *twisting*. The mountain will not go to Mohammed, therefore Mohammed must go to the mountain. A little investigation would enable managers to understand why the body is so soon worn out, and the cause of leaky roofs, broken nails, loose boards (siding), loose braces, loose bolts, rods, and the general dissolution that occurs in four or five years' running; and how much more can be expended in springs of the requisite *motion*, or in arrangements that will make a car-body practically centre-bearing at one end (to prevent the twisting), and still result in economy.

"Another defect is in the strength of the draft-arrangement. The long list of disasters, delays, and expenses resulting each year from the weak and defective draft-arrangement, draw-bars, etc., if detailed, would 'even astonish the natives.' When security in this particular can be assured, under ordinary circumstances, at so small an additional cost, it is singular that this defect is not remedied. The link and pin, as ordinarily used, is equally deficient in strength, as the remains in scrap-heaps along the roads will show. If links and pins are constantly breaking, it would seem to be wisdom and economy to increase the strength until breakage under all ordinary circumstances would not occur. That course is usual in other matters; why not apply it in this? With a total car-mileage on this road of about 900,000 miles per month, our average consumption of links and pins, to supply breakage and loss, will average over 7000 lbs. per month, and from what I can learn of other roads, we are under rather than above the average in this respect.

"Another defect in the proportions of cars, on many roads, is in the diameter and length of journals. Seven inches long and not less than 3½ inches in diameter will be found to be *economy* over a smaller size, if tested. End-play of journals should be as little as practicable, and if boxes next the hub of the wheel are made *thick*, so as to allow for the wear of the hub in the end-thrusts of the wheels, and *close* enough when new to allow but about one eighth inch lateral play between the box and hub of the wheel, they will, in my opinion, formed from experience and observation, give better results than are obtained under common practice. I could name roads that suffer in delays and expense fearfully on account of the excessive end-play of journals, the collars cutting into the brasses as much as 1¼ inch at each end, reducing the bearing-surface often to half the original length, the box being so far from the hub of wheel that the collars only are depended on to prevent lateral play. 'Patent lubricants for cooling hot boxes' are always in demand on those roads."

Lined Iron Pipes.

BRITISH patents have been issued for a process of lining or coating wrought or cast iron pipes with lead, tin, or other suitable metal or alloy, or gutta-percha, or a mixture of gutta-percha and other material suitable for preserving and increasing the durability of the pipe and enabling it to withstand, when laid beneath the surface of the ground or otherwise, the action of any liquid or other matter, whether heated or not, to which it may be subjected. An iron or other suitable core is placed inside the pipe, leaving a space between it and the pipe corresponding to the thickness of the intended lining. The lead, tin, or other material is then melted and forced in by hydraulic or other pressure between the tube and the core. When the lining has cooled sufficiently, the core is removed, and the operation repeated for an additional length of the pipe, where the pipe is too long to admit of the whole being completed in one operation. For coating the pipe, a mould or barrel is passed over the pipe, sufficient space being left between it and the pipe to admit of the desired thickness of coating being applied, the operation of coating being similar to that of lining.

Locomotive Improvements.

AN English journal says that a M. Mallet has taken out a patent for several improvements which, it is thought, may prove of real advantage. In order to obtain a large furnace without disarranging the balance of the various parts and with the power of placing a driving axle beneath the fire-bars, the inventor separates the furnace entirely from the cylindrical body of the boiler, the lining of the furnace containing water at a different level from the water in the boiler, while the pressure in the two may also be different in the two parts—more elevated in the boiler, which has greater powers of resistance, and less so in the lining of the boiler. The working parts are much altered; for the inventor adopts two cylinders of different diameters—one with a cut-off—but both being capable of working at full pressure. The small cylinder is fed from the boiler at high pressure, and the discharge is made into the lining of the furnace, where the pressure is less and whence the steam is taken for the large expansion cylinder. The cylinders are incased in jackets of thin sheet-iron, and the space is filled by the escape steam superheated in a coil placed in the smoke-box to a temperature superior to that of the steam in the boiler.

THE master-mechanic at the Pennsylvania Railroad shops at Altoona has issued an order notifying the employees that working-time will consist of ten hours. A large additional force of employees has been furnished with work, and it is to be presumed that times will now improve in the Mountain City.

Thorough Workmen.

SAYS an exchange, "There is no more honorable position in life than that of a good craftsman in a useful occupation. His horny hand is a more honorable badge of public service than the bejeweled digits of the dainty clerk or man milliner. His labor-begrimed face or greasy working-dress are proofs of the exaltation of his rank among men. An honest, competent workingman has peers, but no superiors. But to deserve all his honors he must be competent—skilled in the mysteries of his craft. And it is no use for people to say that their superior intelligence makes up for every thing; for a man with the wisdom of Solomon could not constitute himself a perfect artisan without the practical experience which makes a man such. Journeymen are turned out in multitudes, day by day, who have hardly an idea of the first principles of their trades; and many young men, hardly yet of age, are found bold enough to profess a thorough knowledge of two or more handicrafts, any and all of which they really know little or nothing about. Ask employers from whence they have their most skilled laborers, and they will tell you that they come from those workshops where long apprenticeships served to turn out thorough workmen; where engineering is not learned in a year—shoemaking in a month—or printing in a few days. There are many reasons why this whole subject of mechanical training should be pressed upon our young men who expect to live by mechanical labor. The great enemy of the working-man is the crowd of bad workers who are admitted to his status without the proper experience for which he has paid years of effort."

Carelessness of Employees.

THE Illinois Central has issued the following notice to its employees: "Hereafter no compensation will be allowed to officers or employees who may be injured in the service of this company, when such injuries have been caused by a violation of its rules and regulations or by carelessness or want of proper precaution on the part of the parties injured. In coupling cars, if a stick or hook is used instead of the hand to guide the link, and if proper caution is observed, there will be no accidents from this cause. Getting feet fastened in frogs and falling on the track, resulting from attempting to place links and pins in draw-bars while cars are in motion, and not unfrequently walking backward while doing so. Scarcely an instance occurs in train service, where men are hurt, that if proper care had been observed the accident would not have been averted. An employee who does not use prudence and take proper precautions to guard himself against injury can not be trusted to take care of this company's property. All such must be dropped from the service. Every application for a donation or claim for compensation from injured employees must rest upon its own merits, and be accompanied by a report from the head of the department in which the person was employed, setting forth all the facts and circumstances connected with such injury."

THE Savannah and Charleston Railroad is building one day-coach at the Charleston shops. Mr. J. D. Murphy is the master car-builder.

An Improved Freight-Car Lock.

THE need of a perfectly secure and reliable fastening for the doors of freight-cars has long been felt by railroad men. Many devices for this purpose are already in use, embracing padlocks and seal-locks of divers kinds, which afford a greater or less degree of protection according to the modes of construction and application. They are liable, however, to be picked and tampered with by expert depredators, and much loss and trouble are experienced in consequence.

The engravings illustrate what is called the "Dotterer Freight-Car Lock," manufactured by the Yale Lock Manufacturing Company, of Stamford, Ct. It



Fig. 1. Improved Car-Lock applied to Sliding Door.

may be termed a self-locking dead-lock, locking the door when it is closed without the use of the key, and also locking it when open so as to be inoperative without using the key. The almost universal practice is to have a sliding-door which runs on an iron rail at the bottom, and is confined by a rail or guard at the top of the car, these being securely fastened to the frame. Fig. 1 shows a car-side with the door partially open, and locked in such position to promote ventilation. The lock is so attached to the rail that the door can not slide back without removing the

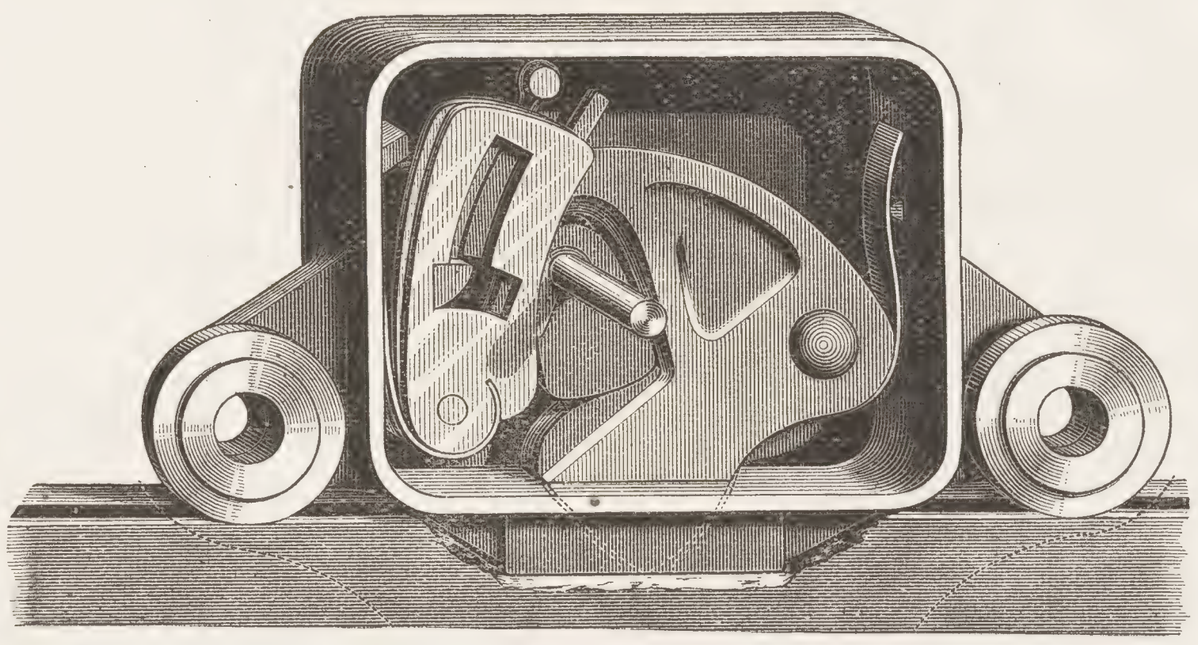


Fig. 2. View of Lock with Face-Plate Removed.

lock, the bolt fitting into notches in the top of the rail, from which it can not be removed until unlocked. If the lock is not fastened to the door it is still secure in its position, because the outside steel plate completely clasps the rail, and hence when the bolt engages a notch, the lock becomes practically a portion of the rail itself. Even when the lock is placed in the middle of the door, it can not be opened after the lock has been sawn off, because, being still fast to the rail, the door can not be moved unless it is taken off bodily from the side of the car.

Fig. 2 represents the interior construction of the lock, the parts being one half the actual size. In the centre is a bolt which is hung on a heavy steel pin on the right-hand side. The bolt is prevented from rising when locked, first, by a cam which is pivoted on the key-post, and, second, by the tumblers in which the stump on the outer end of the bolt is engaged. The cam, which is as strong as the bolt itself, holds the bolt in its locked position, and at the same time relieves the tumblers from the strain which might otherwise be thrown upon them when the car is in motion. When the key is used in unlocking, the cam is first disengaged from the bolt, then it "sets" the tumblers so that the stump on the outer end of the bolt can enter their "gatings," when the bolt is free and can be raised out of the notch in the rail. When unlocked, the bolt is securely held up and is then inoperative. A slight turn of the key to the left will then throw the bolt down so as to rest upon the rail, ready to drop into the notches on the rail automatically, when the door is closed.

At each side of the lock is a roller, resting on the top edge of the rail. The front plate of the lock is of steel, made very strong, and secured with countersunk bolts. It extends downward and embraces the lower edge of the rail, and prevents the separation of the lock from the rail in case of an attempt to force open the door. This clasping of the rail by the lock affords one of the chief elements of security; for if the rail be well secured, it makes the opening of the door without unlocking very nearly if not quite impossible, until the lock and rail are separated. This can not be accomplished except by cutting the lock to pieces. The difficulty of doing this was well illustrated some time since by a consignee who found a car-load of his goods secured by one of these locks, and no key at hand. After a considerable time spent in trying to break the lock, he was obliged to give up the job. The lock, which was afterward shown us, showed that the force used had been very great, but the damage done consisted in bending the steel front plate and jamming it fast upon the rail. The lock was disabled for the time, but they were no nearer to getting the door open at the end of their labors than at the beginning.

There is another kind of sliding door used on cars, and in many other situations, which is known as the "overhung" door, that is, the upper and not the lower rail supports the door. To confine the bottom of such doors to the side of the car, it is customary to use several cast-iron brackets, bolted to the side of the car at intervals. One of these is replaced by a casting which serves a three-fold purpose—confining the door, providing the notches for the bolt to lock into, and forming a rail which the front plate of the lock embraces, as in the other styles, preventing a separation of the lock and rail in case of an attempt to force the door.

THE Georgia Railroad Company is building, at its shops in Augusta, three passenger-coaches. No foreign woods are used for inside finishing, nor in any other part of the structure.

THE Wilmington, Columbia and Augusta Railroad is building, at its Wilmington shops, two parlor-cars, with Anderson's patent bolsters.

The National Car-Builder

PUBLISHED MONTHLY,

BY

VOSE, DINSMORE & CO.,

32 WARREN STREET, NEW-YORK; 194 LAKE STREET, CHICAGO; 720 NORTH SECOND STREET, ST. LOUIS.

JAMES GILLET, EDITOR.

Terms, $1.10 per Annum.

MAY, 1875.

Editorial Announcements.

CORRESPONDENCE.—*We cordially invite the co-operation of the railroad public in affording us the material for a good mechanical paper. Articles relating to rolling-stock and machinery, by those practically acquainted with those subjects, will be gratefully received. All communications must be addressed to Vose, Dinsmore & Co., No. 32 Warren Street.*

ADVERTISING RATES.—*For one square, or one fifth of a column, $5 per month, or $50 a year. For half a square, $3 per month, or $25 a year. Larger advertisements by special contract.*

All communications in regard to advertising should be addressed to L. F. DINSMORE, *Post-Office Box* 4055, *New-York City, who is our agent for advertising, and authorized to make contracts, collections, etc.*

ENGRAVINGS AND ILLUSTRATIONS.

We would invite the attention of Master Car-Builders and others to the advantages to be derived from publishing in THE NATIONAL CAR-BUILDER *engravings designed to illustrate the various features and details of car construction, and especially such improvements as can not otherwise be clearly presented. We will procure cuts to be made in the best manner from drawings or models that may be sent us, and charge only for the cost of engraving, inserting the same in our paper with suitable descriptive details, without charge.*

The Master-Mechanics' Association.

THE eighth annual meeting of this Association will be held at the Cooper Institute, in this city, commencing at nine o'clock A.M., on Tuesday, 11th inst.

The primary objects of this organization, its extensive membership, the relation it sustains toward the great railway system of the country, and the many important subjects which will be presented for consideration, ought to insure a full attendance. The skillful and economical management of the machinery departments of our railroads is a matter of vital interest, not only to the roads themselves, but to the general public in all the manifold relations of society and business. The crisis which has plunged so many roads into embarrassment, and created so much popular discontent with railroad management, calls for greater economy and efficiency in every branch of the service. No small portion of this responsibility devolves upon the master mechanics. Their vocation makes them practically familiar with all the details of the service with which they are identified; and in coming together once a year from their several spheres of active duty, they bring a mass of individual experience acquired in the service of roads located in different sections of the country and subject to different kinds of management. There is, of course, diversity of opinion as to what is best, and the only way to harmonize individual views is to bring them in contact. By isolation they are apt to harden into prejudices, than which nothing can be more detrimental to mechanical progress.

A glance at the list of committees appointed last year affords an idea of the magnitude and scope of the usiness the convention has in hand. The subjects embrace some of the most important details of railway operation, and bear more or less directly upon the economical maintenance of the system. An annual session of three or four days seems a mere modicum of time for the intelligent discussion of the various topics in the programme. A month would be better; but as the absence of the members from their several posts of duty for such a length of time would bring half the roads to a standstill, they will be expected to do a great deal in a very short time. This can be accomplished by talking to the point, and by having duplicate copies of reports so they can be read by each member when the convention is not in session. A circular was issued last year asking the counsel and co-operation of the presidents and superintendents of roads, and it is to be hoped that at the present and future meetings of the Association the valuable aid of these officials will not be withheld.

Competition in Trade.

EXCESSIVE competition is a natural result of prolonged business depression. It extends to manufacturers and dealers of almost every class, and is productive of more or less injury to all concerned. A brisk bidding for a market in prosperous times is not detrimental to trade, but tends rather to secure a fair distribution of the rewards of industry among the great mass of producers and consumers. It acts as a healthy stimulus to enterprise, and is the efficient means of maintaining a proper equilibrium in the complex relations of business, without which there would be no enduring prosperity and growth. This kind of competition is the life of trade. But when it is the product of financial derangement the case is widely different. A forced reduction of prices during periods of stagnation, distrust, and embarrassment, creates no additional demand. The market can absorb only so much as is really wanted, because no one cares to buy what he can not sell or turn to some profitable account, merely because he can buy it cheap. The business of the country can not be galvanized into healthy activity by remorseless raids upon prices, or by struggling to secure a slender margin of profit in manufacture by inferior workmanship and the use of second or third rate material. The buyer of such wares secures an apparent advantage by getting them at a comparatively low figure, but in the end he is pretty sure to discover that he has got no more than he has paid for, if, indeed, he has not paid for more than he has got. The seller or manufacturer has in such case made a bare profit at the expense of his reputation, a process which becomes the more necessary the oftener it is repeated, until the climax is reached and there is no longer any margin of profit left. The trouble is not that prices are too high, but there is for the time being a cessation of demand. The insane rivalry now prevailing in many branches of industry is as short-sighted as it is demoralizing. The cheapening of material, the lowering of old and tried standards of excellence, and the reckless cutting of prices, are producing an amount of mischief which can only be estimated in the future. The folly of the proceeding is aptly illustrated by the witling who inadvertently sawed off the limb upon which he was sitting, and did not perceive his mistake until he heard something drop.

So long as the better judgments of men are overborne by their necessities, it is futile to dwell upon the moral or practical bearings of the case. The evil will in time cure itself, no doubt, but while it lasts, railroads are likely to suffer as much or more by it as any other department of industry, their economical operation being so largely dependent upon integrity of material and the perfection of every mechanical detail. It does not pay to abate one jot from what has been approved by experience and test, in order to save a trifle in the first cost. A single defect is sure to involve, like a weak link in a chain, the whole structure. A bad piece of metal in running-gear or track may sacrifice a dozen lives in a moment, and sink a year's dividend in repairing damages and settling lawsuits. No financial exigency can modify mechanical laws in their application to this important service, and we apprehend the time is not distant when managers will concern themselves less about price than quality in the purchase of every class of supplies. It will be considered of less importance that cars should be got out at contract price, than that good iron and well-seasoned timber should go into them. The value of cheap oil will be estimated by the time and labor expended in taking out axles and repairing cut journals; job castings received in barter for rubbish and scrap, will be rated at their proper worth, and so on through the entire catalogue of wasteful expenditure. The prevailing competition, in some exceptional cases no doubt, is productive of better devices or a better application and use of material than have heretofore existed, and so far it is a benefit; but the natural tendency of the scramble is to impose on the market inferior wares, which in the long run are extravagantly dear at half the money paid for them. It is unnecessary to particularize. Every experienced railroad man can make his own comparisons of articles of the same class now pressed upon the market at half the price they were sold at five or six years ago, and in most cases it will be found that the reduction is more than justified by the deterioration in quality.

Heating and Ventilation.

THESE subjects, in their relation to railway passenger-cars, have been very fully discussed within the past two years at the annual and monthly meetings of the Car-Builders' Association, and also by railroad and other journals. Much light has been thrown upon the problem, but not enough to forestall further inquiry and investigation. A lengthy and very interesting report was made last year at Cincinnati by the committee on the subject. The same committee was continued another year, and have issued the usual circulars of inquiry asking for information upon which to base their report to be made at the annual meeting to be held next month in this city. As these circulars are already in the hands of members of the association, and others who are no less interested in the subject-matter to which they relate, we deem it unnecessary to give the questions in detail. It is not too late, however, to urge upon all who may receive such circulars, the importance of giving them prompt attention, so the committee can make use of the information furnished, and be able to submit such a report as the subject demands and the association has a right to expect.

It may be that the time is remote when these twin topics of ventilation and heating, as applied to passenger-cars, will cease to be agitated by inventors, car-builders, scientific investigators, and the traveling public. The difficulties to be overcome are formidable; but it is hardly possible that the earnest and persistent efforts year after year of so intelligent a body of railway mechanics as the Master Car-Builders' Association, can fail of making some progress towards the end in view. The problem, as a whole, is a mixed and complicated one; but there are certain rudimental principles involved which it seems to us can be ascertained and settled definitely, so that as far as these are concerned the ground need not be gone over again. The quantity of fresh air, for instance, required by an average passenger per minute; at what point or points such air can be admitted with least inconvenience to passengers in summer or winter; whether the worst impurities in the atmosphere of a car, with doors and windows closed as they usually are in cold weather, are above or below the heads of passengers; whether such impurities can be more easily expelled by means of exhaust openings near the floor, or at or near the roof; the comparative safety and economy of stoves inside or furnaces underneath the car—and other questions of a like nature which are fundamental, and which appear to be sufficiently isolated to admit of being discussed and settled *seriatim*. Unless the scope of the general in-

quiry can be narrowed in this way little by little, or, in military parlance, by regular advances, we do not see how the fortress is to be captured. Let a distinct proposition be singled out and divested of all incumbrances, form as it were a ring round it, and when it has been sufficiently pelted from every side, let the "sense of the meeting" be taken by a direct vote, and if there is any thing like a decided unanimity of sentiment, consider the point settled, at least for the time being, and advance to the next parallel. Without some proceeding of this kind, it is obvious that the same perplexing issues will continually loom up to be reported upon and reargued every year, revealing the same differences of opinion and the same desire for further information.

We trust the committee on this subject will receive such full responses to their inquiries as to be able to present a report as interesting and valuable as the one made by them a year ago, and that the facts and information embodied in it will be such as to warrant the framing of one or more distinct propositions, by resolution or otherwise, for the acceptance of the convention, and upon which a vote can be taken.

Rail-Joints.

THE believers in perpetual motion are limited in these days to the very few who fail to see the insurmountable obstacle which lies in the way, the nature of which may be illustrated by the inability to lift one's self from the ground by pulling at one's bootstraps. It may be putting it rather strongly to say that it is equally chimerical to attempt to devise a rail-joint that will be equivalent to *no* joint. The problem is one that has baffled the ingenuity of inventors ever since the advent of railroads; but a recent English writer is of the opinion that a system of joint may yet be devised that will make a line of rails as strong in one place as another. The defects of the ordinary fish-plate, and of the various methods for uniting the rail-ends that have from time to time been tried, are familiar to all who have given any attention to the subject; and it is obvious that any contrivance by means of which these defects can be overcome, would be a mechanical exploit that would immortalize the inventor and confer immense advantages upon railroads and the public.

The writer alluded to, thinks that inventors have aimed too much to secure mere stiffness to the joints, without taking into account the deflection or continual yielding of the rail under the tread of the wheel, and that this deflection causes the rail to assume a curve in a vertical plane of greater or less length, a portion of which curve necessarily travels in advance of the wheel. It is the interruption or breaking of this wave of deflection at the joints, which causes the concussion and hammering we wish to get rid of. The point to be attended to is the transmission of this wave from one rail-end to another so that each rail will not as now be acted upon independently of the one in advance. It is evident that no method of uniting the ends that lacks the vertical stiffness of the rail itself, will be adequate to such transmission. The ordinary fish-plate attached to the rail by bolts and nuts, is an appendage, and as such can never be so securely fastened as to amount to a practical weld. Under the strain to which it is subjected, it can never make the joint any otherwise than a comparatively weak place, and altogether inadequate to transmit the wave of deflection unbroken from one rail to the other. The only case cited by the writer in which this has been accomplished, was in placing the ends of the rails in a socket chair, and filling the space between the chair and rails with molten iron. This was not only expensive, but made it very difficult to take out a worn rail and replace it with a new one. Other difficulties we should think would attend such a plan—the shrinkage of the metal in cooling, and a lack of room for expansion of the rails.

We remember many years ago riding over a short section of road somewhere in New-England, laid with what was called a continuous rail. The ends of the rails were lapped so as to break joints. There was absolutely no perceptible concussion, and the train glided along as if sliding on ice. We thought the very acme of luxurious traveling had at last been realized; but for some reason, probably the short life of the rails or mechanical defects inherent in the system, the plan was found impracticable and was abandoned. Now, as we have said, if inventors can overcome these obstacles and give us a rail-joint that will be substantially equivalent to *no* joint, it will be an achievement compared with which perpetual motion and the philosopher's stone are but childish baubles.

The Axle Question Once More.

Two years ago the master car-builders, after a prolonged and animated discussion, agreed upon the form and proportions of a car-axle, which, in the judgment of a majority of those who voted on the question, ought to be recognized and adopted by all roads as an established standard, and thereby secure the advantages of uniformity in this fundamental feature of a car. However worthy of acceptance these proportions may be, it is obvious that such an axle will never become an absolute standard until it is approved by more than a bare majority of those who control in one way or another the operation and management of our railroads. If it is deserving of such approval it should be accorded without delay; if not, its defects should be ascertained and remedied.

The master mechanics who are soon to meet in this city are expected to take some definite action, either by indorsing the form and proportions recommended by the master car-builders, or by proposing some modification of the same. The committee in charge of the subject is composed of experienced and capable mechanical engineers, who will doubtless embody in their report whatever information can be obtained in regard to the working of the axle recommended by the car-builders upon the roads now using it. We do not anticipate that any material modification of it will be proposed. The only objection of any force that we have heard urged against it, is on account of its weight, which is thought by some to exceed the orthodox limit, and which it is thought might be reduced at least ten per cent by reducing the diameter between the wheels, and especially at the centre, leaving the other dimensions as they are. In regard to an increase of friction being a necessary result of larger and longer journals, we think the objection on this score has not been sustained by any theoretical or practical demonstration, and should be ruled out in all future discussions of the axle question. We see no reason why the two associations should not come to an agreement at their meetings the present year, so that, as far as *they* are concerned, there will be unanimity. This much accomplished, the roads will the more readily fall into line, and in a few years there will be uniformity in the matter of axles. The unquestionable benefits which will result will make it easier to bring about a similar uniformity in other parts of cars, and finally relieve the roads of the expensive, annoying, and unnecessary diversity which now exists.

OUR information from all quarters indicates a decided increase of business in the car-shops. The working force in many cases has been materially increased, and there are more contracts for new work than have been reported for many months past. There is also increased activity in the repairing of old stock, and most of the shops are running on full time.

THE Chicago branch-office of Vose, Dinsmore & Co. has been removed from 52 Fifth avenue to 194 Lake street.

NO formal discussion took place at the car-builders' monthly meeting for April. In consequence of the nearness of the annual meeting, no monthly meeting will be held for May.

Annual Conventions.

THE Railway Master Mechanics' Association will meet at Cooper Institute, New-York, May 12.

The Railway Purchasing Agents' Association will meet at the Lindell Hotel, St. Louis, May 12.

The Master Car-Builders' Association will meet at the Grand Central Hotel, New-York, June 9.

The Master Car-Painters' Association will meet in New-York, September 1.

A Hint or Two about Advertising.

EVERY shrewd business man is aware that money expended in judicious advertising is always a paying investment. The *ears* of customers can only be reached by solicitors and traveling-agents, and but a few pairs of them can be addressed at once, while advertisements are addressed to the *eye*, and can be seen and read by thousands at the same time. They bring buyer and seller in contact who might otherwise never have heard of each other. It pays to *study* advertisements. Taken collectively, they are the mirror in which the surging activities of the age are faithfully reflected. The pursuits of men are so diversified, there are so many new inventions, improvements, styles of merchandise, and articles of utility and convenience constantly pressed upon the market, that he who does not keep read-up in current advertising gets as far behind the age as he who tries to make his business pay without advertising. An advertisement works nights, Sundays, and holidays, and always says what it is told to say, no more and no less. Every new business or undertaking finds in advertising the key to success; nor can old houses of established reputation afford to dispense with it. However well known, they are in danger of being lost sight of by new men who are continually entering, with energy, enterprise, and capital, the arena of business. When competition rages, he who refuses to advertise is sure to be distanced in the race—other things being equal—by his more shrewd competitor who does advertise.

These considerations apply with peculiar force to all who seek the patronage of railroads, as our many advertising friends who have for years made THE CAR-BUILDER a medium for their favors, can testify. During the long and unexampled period of dullness which we trust has at last reach its turning-point, our advertising pages have experienced no collapse or shrinkage; and while tendering our thanks as we now do for these favors, we solicit their continuance in future. Our paper is printed in a style of typography which displays advertisements to the best advantage, and being stitched and trimmed, and in a form suitable for binding, it is not thrown aside as readily as an ordinary newspaper. This is a matter which advertisers should bear in mind.

Electric Whistles for Locomotives.

THE plan has been satisfactorily adopted on some of the French railways, of having a stationary electric battery blow the whistle of an approaching locomotive, in case the road is not clear, without the engineer having to give any attention to it—that is, the obstruction at the depot starts the steam-whistle on every approaching locomotive, when the train is still far enough away to slacken speed and stop. This system, it appears, has now been in successful operation for a year on one of the principal railways in France, faithfully informing the engineer whether the way is clear or not. The signal-tender turns a disk, and sends an electric current in the direction of the coming train to a bar that is placed between the rails; when the engine reaches the spot, a metal brush placed between the wheels sweeps the bar—the current passes to the engine, and, by means of an electro-magnet, presses upon a lever which opens the steam-whistle, thus making it blow automatically. This arrangement is found to be very useful at night, and especially during a fog.

Recent Patents.

IMPROVED RAILWAY SWITCH.—Samuel T. Dutton, Worcester, England.—This invention provides a means for rigidly securing the facing-points of switches, to prevent the possibility of the points being fouled by the opening of both tongues at one time. The switches are made from twenty to twenty-two feet in length, and are connected and moved separately, in such a manner that only one tongue can be moved at a time. The switch is connected to the single rod by cranks at two or more places in its length, thereby holding the switch firmly and equally against the stock-rail at different points. To secure the facing-tongue close up to the rail, at the point of each tongue is placed a cam, moving on a stud on the point chair, each cam being connected to and moved by the opposite switch. It follows that, when either of the switch-tongues is opened, it will cause the other tongue, which then becomes the facing-switch, to be secured in its place, and, as the open or free switch can not be closed while a train is passing or standing in them, the facing-switch thereby remains secured.

IMPROVED THROTTLE-VALVE.—Ethan A. Gates, Burlingame, Kan.—The packing is an elastic ring cut longitudinally, and confined between the shoulder of the valve and below the nut at the top, and is made to snugly fit the valve-cylinder. This packing-ring is expanded by means of a wedge. A chamber in the shell, around the cylinder, is provided with three ports on the sides of the valve. When the valve is on its seat these ports are closed, and when the valve is raised the steam passes through the ports into the chamber, and is discharged into the steam-pipe attached to the shell. An oil-tube passes down through the shell, and delivers oil to lubricate the valve. This valve is balanced by the pressure of steam upon its sides, so that it works up and down without undue friction, and always works steam-tight.

IMPROVED DEVICE FOR LIFTING AND MOVING RAILROAD-CARS.—Benjamin F. Phelps, Kansas City, Mo.—The object of this invention is to provide means for conveniently lifting and moving railroad-cars and other heavy bodies; and it consists of a lever, to which is attached a movable fulcrum, and also a roller and push-bar. The push-bar is forked to go over the end of the lever, and has an adjustable dog on its end, by means of which it is attached to the angle of a car. By means of a self-adjusting fulcrum-pawl, the lever may be applied by either lifting or bearing down, as may be desired.

IMPROVED COMPOUND RAILROAD RAIL.—Isaac Thomas, Jackson, Mich.—This compound rail is formed of two parts or sections, which are confined together by keys. A beveled surface gives the head of the rail a good bearing, while the key holds the foot-piece securely to its foundation. The key passes through holes punched in the parts of the web at suitable distances from each other, and stands at an angle of about forty-five degrees with the base, with its main bearings on the outside of the web, and on the top of the foot-piece.

STATION INDICATORS.—I. D. Smith, Gregg, New-York.—The flaps or boards indicating the stations are hinged to rods located in the centre of a box, their free ends resting upon a support attached to the back of the box at the top and bottom thereof, and are temporarily held in place by the end of a notched bar attached to a reciprocating slide, which passes over the open face of the box. When the flaps have been released to fall to the bottom of the box, the slide is moved to that end also, and the box is then inverted to commence the former operation.

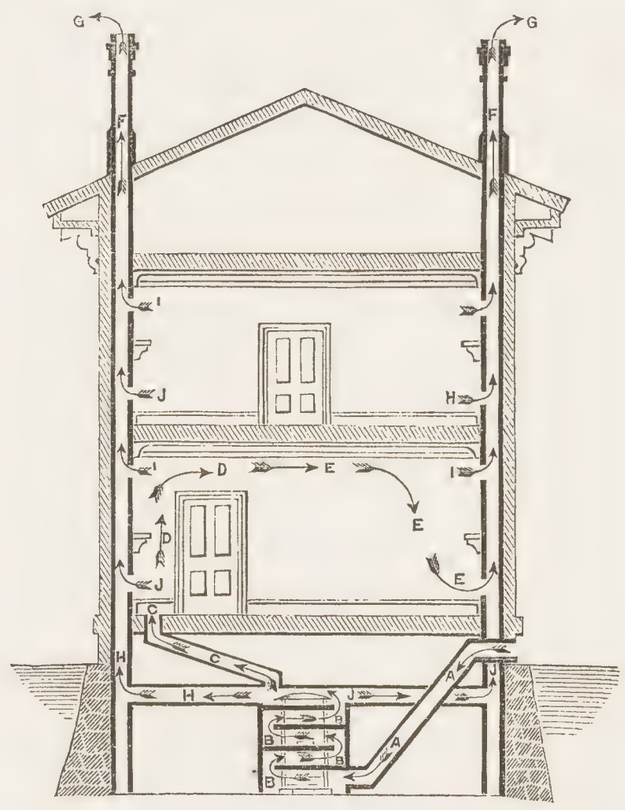
RAILWAY RAIL-SUPPORT.—Samuel L. Porter and Duane Pech, Rochelle, Ill.—A hollow metal rail-support, provided upon its upper side with lugs, between which and the rail are inserted securing-blocks, one of which is wedge-shaped, and when driven home is secured by a set-screw. The support is also provided with diagonal slots, the outer ends of which are enlarged to allow the insertion of the heads of the bolts which secure the rails.

SLEEPING-CARS.—Christian E. Lucas, Atlanta, Ga.—An upper berth to take the place of the inner paneling of the upper part of the car, supported by its lower and inner sides upon a moulding, and hung to the wall of the car by triangular pieces, which form divisions between the berths, and allow the berth so much play that it can be readily lifted from the moulding for cleansing purposes. Also a sliding-seat-frame, a window recess, etc.

The Ventilation of Houses and Rooms.

IN the January CAR-BUILDER we illustrated and described a method of ventilation for railway-cars, by which the admission and escape of air was so regulated as to provide for its constant renewal without lowering the temperature in winter below the medium required for comfort. We now give a drawing illustrating the same principle in its application to houses.

Ventilation, whether in cold or warm weather, consists simply in introducing an adequate supply of pure air, and a simultaneous withdrawal of a like quantity of impure or vitiated air. Whoever has carefully investigated the matter, will be forced to the conclusion that the old plan of letting out the air at the top of an apartment in winter, except in cases of overheating, is a very imperfect and wasteful method of securing a fresh supply. The warm air which escapes is not necessarily vitiated, but is, as a rule, purer than the lower strata of colder air, especially if the apartment has many occupants to contaminate the air by breathing. The essential thing is to retain the pure or unbreathed air and expel the impure without



undue waste of that which has been warmed by the heating apparatus. Any plan which secures this, is effective and economical ventilation.

It is not of much importance where the fresh air is introduced, so the draught does not come in direct contact with people; but the place or point of exit is all-important, as it determines the quality of the air withdrawn, and also of that which remains; for if such place of exit is at the top or near the ceiling, the warmest and generally the purest air in the room escapes, while the heavier and colder air, and especially the poisonous carbonic acid exhaled with the breath and which necessarily falls on account of its greater specific gravity, are retained in the apartment. But if the exhaust openings be located near the floor, in connection with vertical flues in the walls, the impure, cold, and heavy air will necessarily be forced out by the constantly accumulating volume of warmed air at the top. Openings should therefore be made at the bottom, but should never be used in the upper parts of a room except in warm weather, or when a room is excessively heated in winter.

The drawing represents a section of the stories of a house, with a heater or furnace, B B, in the basement. The arrows A A indicate the fresh air coming in from without, and after it has become heated by passing around the furnace, is conducted to the first story through the pipe C C, follows the direction of the arrows D D and E E, while the cooler and lower strata, in order to make room for it, are forced out on the opposite side near the floor, as shown. H H and J J represent currents of heated air conducted in like manner to the stories above through separate flues, which are not shown in the engraving owing to its being simply a sectional view. The apertures, I I, near the ceiling, are to be kept closed except in warm weather, as before stated, or when the rooms are overheated.

Where hot-air furnaces are not used, currents of pure air can be introduced and warmed by passing them around stoves or steam registers, or about the sides and backs of fireplaces and then into the room. This method of ventilation, as we stated in a former article, is the invention of Mr. James M. Palmer, of Portland, Maine.

The Hannibal and St. Joseph Railroad.

WE clip from the editorial correspondence of the *Railway Review*, the following reference to the condition and good management of this road:

"The admirable system of maintenance, both of permanent way and equipment, adopted six years ago, has been continued and perfected, and the traveler now rides over a track first-class in most respects, and in cars second to none anywhere in the West. Along with economy in operation, the management exhibits a policy which wins and retains the favor of the local public along the lines, and is remarkably friendly and conciliatory toward its connections (some of them representing competing interests) East and West. For example, at the same time that it announces a daily fast through train between Kansas City and New-York, *via* the now allied line of the Toledo, Wabash and Western, it is able to give the public the choice of equal accommodations *via* Chicago, over the Chicago, Burlington and Quincy Road and its Eastern connections. I came by night train from Chicago, taking a parlor-car of the H. and St. J. at Quincy. And, by the way, these parlor-cars which accompany the day express each way are an accommodation worthy of note. They are built and run by the railroad company, on the fine model of construction for which the shops of this road became noted years ago. The term 'parlor' is no misnomer. Their appointments are those of the tasteful drawing-room, the great, elegant arm-chairs being a marvel of home-like luxury. The upholstery is rich and tasteful; and along with the accessories of toilet-room and closets, there is an elegant compartment where the sick or wearied can secure quiet and retirement. I believe that it was the intention to open these cars to the patrons of the road without extra charge, but it was found that in the interests of the comfort which they were designed to secure, some restriction must be put upon their use, and so a merely nominal extra charge is made for these superior accommodations. For fifty cents, in addition to the regular fare, the traveler enjoys the use of these fine carriages (the English term seems most appropriate here) during the whole twelve hours between Quincy and Kansas City.

"I was careful to note, throughout the day, the condition of the track, and found it, with the exception of isolated patches here and there, good and well maintained. On a line along which there is scarcely any material for ballast, the bed is solid, smooth, and neat, and the want of gravel or stone is compensated for by an increase in the number of ties, considerably above the ordinary maximum of 2600 per mile: along large portions of the road, and wherever needed, I should judge the ties are laid from 3500 to 4000 per mile.

"The country along the line exhibits marked signs of improvement since I last traveled over it; and this is especially notable in the appearance of the towns, which have taken on an appearance of life, thrift, and

neatness to which they were strangers at the close of the war. The country is one of solid resources, and the company are apparently co-operating with the people in its development. As an indication of the liberal and wise policy of the management, I may note the plan of selling round-trip tickets from local points to all other local points at a reduction of one fifth from the regular rates, giving the people who really sustain the road the same benefit of reduced fares enjoyed by the through passenger.

Miscellaneous Items.

WORK has been begun at the Schenectady (N. Y.) Locomotive Works on an order for twelve heavy ten-wheeled engines for the Central Pacific Railroad. One hundred and fifty men are employed at present, but the force is to be increased.

THE repairs to the New-York Elevated Railroad have been completed. The gauge has been changed to 4 feet 8½ inches, and the track laid with new steel rails resting upon wooden cross-ties. Six new cars and two additional dummy-engines are to be placed on the road. A turn-out has been built at Franklin street, which enables trains to run twice as often as heretofore.

THE Sacramento (Cal.) *Record* of February 9th says: "Upon the arrival of the east-bound express train at Sacramento, yesterday, it was ascertained that one of the wheels under the forward portion of the postal-car was cracked, rendering it necessary to remove it. The car was taken to the repair-shops, the truck taken out, the wheel removed and a new wheel put in, all in twelve minutes, under the efficient direction of W. B. Ludlow, master of repairs. This is considered very quick time for this kind of work."

IT is stated that the Pennsylvania Railroad Company has made a radical change in the standard section for 67 and 60 pound steel rails. The new section has a head with a decidedly angular appearance, nearly flat on the crown, with sides presenting a large and corresponding surface to the wheel flange, and with its weight of metal greatly increased, which (the weight per yard remaining the same) necessarily reduces the area of the neck and flange or base. The width of the flange, moreover, is increased. The changes conform pretty nearly to those adopted by the Erie Company.

A BILL for the prevention of cruelty to animals while in transit by railroad or other means of conveyance within the Dominion, was introduced and has passed final reading in the House at Ottawa. It provides that cattle shall not be confined on the cars for more than twenty-eight consecutive hours without being unladen for at least six hours for food, rest, and water, and that when cattle are unladen, the railway company having charge of the cars shall cause the same to be cleaned out and to be freshly littered with clean sawdust or sand. In reckoning the period of confinement, the time on connecting roads in the United States is to be included. Penalties are imposed for violation of the act, and suitable provisions made for its enforcement.

THE report of the Atlantic and Gulf Railroad for 1874, makes the following favorable exhibit of its business:

Passenger earnings (gross)	$195,501 51
Freight earnings "	738,802 83
Mail and incidental "	97,951 82
Total net earnings	307,076 17

The operating expenses are about 70 per cent of the gross earnings. Average fare per passenger, $1.88. The road has 26 locomotives, 27 passenger-train cars, and 353 freight-cars of all kinds. The average car mileage is 22,179 miles. Four persons were killed during the year by passing trains, and 1031 head of cattle and other stock, the latter valued at $8968.25. The road carried during the year 119,480 bales of cotton.

THE annual report of the Lake Shore and Michigan Southern Railway Company, to be presented at the meeting of stockholders, and covering the fiscal and calendar year 1874, shows the following among other items of interest: The miles of road operated in 1874 were 1175.39, the same as in 1873, but the side tracks were increased 40.67 miles; 514 miles of single track out of 770.45 on main line, being two-thirds the amount, are laid with steel rail, and the total miles of single track to be maintained are 1835.4. There was expended within the year for construction $1,043,-723.82, and $702,782.09 for equipment. The total cash outlay for construction and equipment during the five years from January 1st, 1870, to December 31st, 1874, was $19,163,695.32, to which is added the cost of the Northern Central Michigan road, $1,347,-494.96, making $20,511,190.28 expended upon new work in five years.

THE HITCHCOCK CAR-VENTILATOR.—We are informed that notwithstanding the light business which has been done in the car-shops of late, the demand for this excellent ventilating device is steadily on the increase. The proprietors, Messrs. H. D. Carroll & Co., of Springfield, Mass., have recently received a number of large orders from leading car-manufacturers in different parts of the country. It has been in use a number of years, having been introduced at first on a few New-England roads, where all doubts were speedily removed as to its superior merits, and it is now to be found on the better class of passenger-cars on most of the leading lines of road. The ventilators are placed, as usual, in the car-roof, and supply and exhaust the air alternately. They are effective, noiseless, always in place, inexpensive, and require no special attention. For description and illustration we refer to advertisement, page ii.

Facetiæ.

WASHINGTON IRVING once alluded to a man of superior pomposity as "a great man and, in his own estimation, a man of great weight. When he goes to the west, he thinks the east tips up."

A NEW-YORK lawyer has a bottle of sherry wine that was put up in 1774. The cork will be exhibited at the Philadelphia Centennial, and any body that has $5 that he doesn't care for, can take a smell.

A VERY fat man, for the purpose of quizzing his doctor, asked him to prescribe for a complaint which he declared was sleeping with his mouth open. "Sir," said the doctor, "your disease is incurable. Your skin is too short, so that when you shut your eyes your mouth opens."

A GENIAL, bald-headed gentlemen, while in Paris, went one day to the Zoölogical Gardens. The weather was warm, and he lay down on a bench. Presently he fell asleep, and he was aroused by a warmth about the head. An infatuated ostrich had come along, and mistaking his bald head for an egg, settled down with the determined resolution to hatch it.

A GROCER in a certain town keeps a little brown jug near his cider-barrel, and when he wants to do the fair thing by a customer, he mingles some of the contents of the aforesaid jug with the cider. He made a mingle the other day for an old farmer, but got in a good deal of benzine and a very little cider. About an hour after drinking, the farmer was observed leaning against a fence, and was heard to soliloquize: "It's too early for sunstroke, and too late to freeze to death, and I guess it's a touch of the shakin' ager."

AN Irishman went into a gin-mill in Louisville, took a drink, came out. He stood a few minutes, when "things commenced workin'." He grabbed his stomach, twisted his face out of shape, rushed back into the gin-mill and shouted to the bar-tender, "Say, I axed ye for whisky, an' ye gave me the wrong bottle; hand me a barrel o' water, until I pour it down an' drown the torchlight procession that's goin' through me this blissid minit. Och! murther, I'm on fire!" And they "put him out."

DURING a class-meeting held by the Methodist brethren of a Southern village, Brother Jones went among the colored portion of the congregation. Finding there a man notorious for his endeavor to serve God on the Sabbath and Satan the rest of the week, he said, "Well, Brother Dick, I am glad to see you here. Haven't stole any turkeys since I saw you last, Brother Dick?" "No, no, Brudder Jones; no turkeys." "Nor any chickens, Brother Dick?" "No, no, Brudder Jones; no chickens." "Thank the Lord, Brother Dick! That's doing well, my brother!" said Brother Jones, leaving Brother Dick, who immediately relieved his overburdened conscience by saying to a near neighbor, with an immense sigh of relief, "If he'd said ducks, he'd a had me!"

INDIA-RUBBER sidewalks are coming into fashion out West. For small towns they are admirable—combining economy with durability. The first experiment was made in Danville, Iowa, where three hundred yards were put down on one of the principal streets. All the boys in the place ran over it, but there was no noise. A leading merchant stopped in front of his house, then jumped on his heels. The elastic forces hidden in the rubber threw him over the gate to the roof of the piazza. But after a few trials he was able to alight on the steps with the graceful accuracy of a flying squirrel. The chief drawback to the walk is its odorous familiarity in hot weather, but it can be neutralized by a weekly wash of borax and coal-tar. Its principal advantage is that it can be stretched. As the town grows, it is pulled out towards the suburbs. Two yoke of cattle can lengthen it three times a day.

ROOFS.

IMPROVED PLASTIC SLATE.

Will repair and preserve old Roofs of Shingles, Tin, Cement, or of any kind, CHEAPER and more substantially than any thing else in use. It has been tested and improved upon for TEN YEARS, and is a perfect protection against *Weather* and *Fire*, and is INDORSED by EIGHTY-TWO FIRE INSURANCE COMPANIES. Reference is made to over **2000** *Roofs* in New-York, on CHURCHES, BROWN STONE DWELLINGS, FACTORIES, etc. It is equally good for *Steep* or *Flat* Roofs, and is easily applied on old or new buildings.

PRICES OF MATERIALS READY FOR USE.

PLASTIC SLATE PAINT, 60 CENTS PER GALLON. 1 gallon will cover nearly 200 square feet.

Plastic Slate Roof Coating, THICK, 60 cents per gallon. 1 gallon will coat about 100 square feet.

Plastic Slate Cement, for pointing up Chimneys, etc., 10 cents per pound.

One, Two and Three-ply Roofing Felt and Building Paper, 1, 2 and 3 cents per square foot.

Materials put up for shipment to any point, with simple instructions for use.

General Merchants should sell these Improved Plastic Slate Roofing Materials, as they can recommend them with entire confidence.

EDWARD VAN ORDEN & CO.,

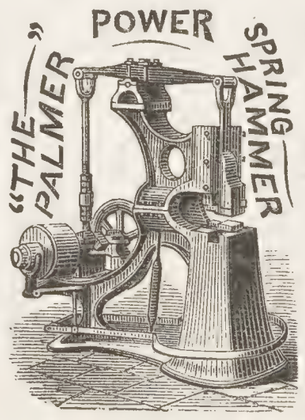
(Established 1863,) Sole Manufacturers, **79 Maiden Lane, N. Y**

THIS HAMMER

Awarded the First Premium of a Silver Medal

AT THE

American Institute Fair, N. Y. City, Nov., 1873.



Superior in every point to any modification of the Trip Hammer.

Simple, Powerful, Efficient and Cheap.

Four Sizes now being Built.

For Prices and Descriptive Circulars, address the Manufacturers,

S. C. FORSAITH & CO.,

Manchester, N. H.,

Who are also Builders of the

Abbe Bolt-Heading Machine.

The "Eclipse" Fan-Blower,



For Blacksmiths, Coach-Makers, Machinists, Contractors, and all having use for Smith or Forge fires. Suited to any fire, right or left side; works easy, blast regular, and made at will for light or heavy work; only occupies 12×20 inches floor space; cheaper and better than bellows.

ALSO

TIRE BENDERS and TUYERE IRONS.

Circular and Price free. Address

EZRA F. LANDIS,
LANCASTER, PA.

Or T. H. KING & CO., San Francisco, Cal.

EMPIRE PORTABLE FORGES

NO BELTS, BELLOWS OR CRANKS,
THE BEST MADE.
Send for Catalogue to the
Empire Portable Forge Co. Troy, N.Y.
W. C. DUYCKINCK Ag'ts 50 JOHN St N.Y.

UNITED STATES NAVY YARD,
CHIEF ENGINEER'S OFFICE, BUREAU OF STEAM ENGINEERING,
WASHINGTON, D. C., November, 1874.

COMMODORE THOMAS H. PATTERSON, U. S. N., COMMANDANT:

SIR: In obedience to your order of October 5th, 1874, to carefully test the "EMPIRE PORTABLE FORGE," (No. 1, with hood), I have the honor to submit the following report:



The blast is supplied by a small fan-blower, operated with a hand-lever connected to a toothed wheel geared into a pinion. Upon this pinion shaft is a friction-wheel operating against a friction pinion upon the axle of the blower. The shaft of the friction-wheel revolves in sliding supports, to allow for the vibration of the shaft, with a spring acting against each support to keep the friction-wheel against the pinion.

The blast is strong, and sufficient to keep up any required amount of heat. The fire-pan is covered with a hood of cast-iron, with doors for passing the rivets.

This is a very excellent and convenient forge. It works easily and with but little noise, and the power being applied with a lever, it can be worked without interfering with the manipulations of the fire.

I can recommend it as a very useful tool for work on shipboard or shop use. Very respectfully, your obedient servant,

[Signed] EDWIN FITHIAN, Chief Engineer, U. S. N.

Read Advertisement of
BRIDGES' LUBRICATOR,
Page x.

Established 1858.



TRADE MARK PATENTED.

The best and cheapest Paint in the world for Iron, Tin or Wood. For sale by the Trade everywhere. PRINCE'S METALLIC PAINT CO., Manufacturers, 96 Cedar St., New York.

CAUTION.—Purchasers and consumers are cautioned against imitations of our METALLIC PAINT. All genuine *PRINCE'S METALLIC PAINT* will bear our name and trade mark on each and every package. Send for a circular.

Excelsior, Steam-Refined, Cylinder, Engine, Spindle, Wool, Carbon, and High-Test

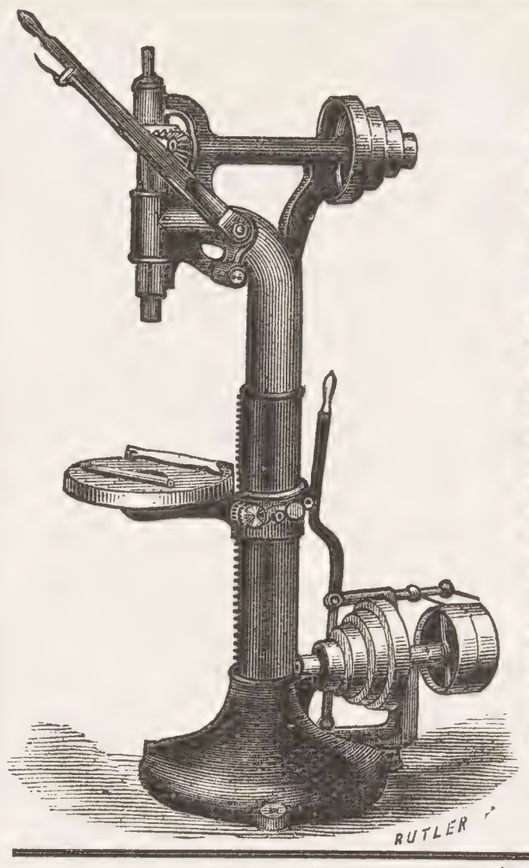
BURNING OILS.

Also, No. 1 Sewing-Machine Oil.

The best and cheapest in the market. Send for circular and price-list.

GRIM BROTHERS,
Dealers and Manufacturers,
Agents Wanted) 236 Penn Ave., Pittsburgh, Pa.

C. VAN HAAGEN & CO.,
PHILADELPHIA, PA.,
Manufacturers of Latest Improved Machine Tools,
Rotary Shapers, Twist Drill Sharpening Machines, Planers, Drill Presses, Portable Drills, Hand or Power, Expanding Boring Bars, Noiseless Friction Gears.
Send for Photographs and Prices.

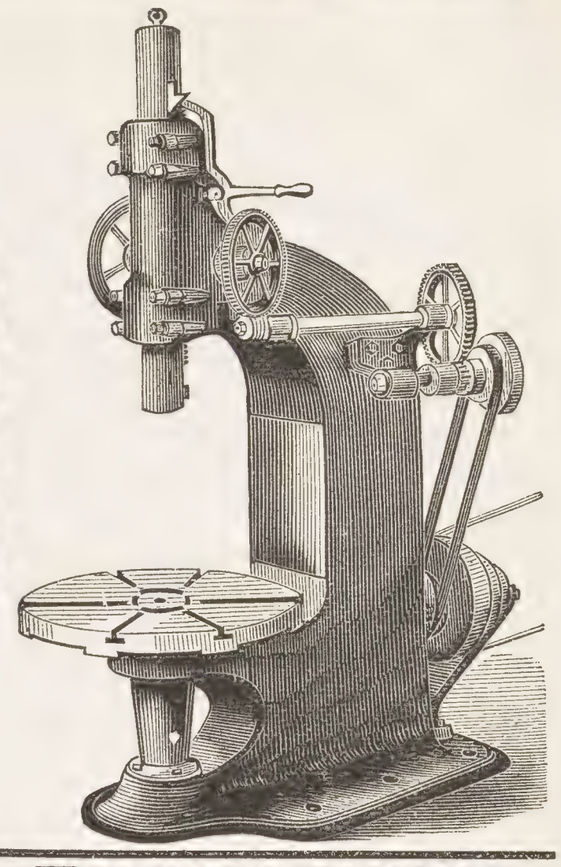


EDWIN HARRINGTON & SON,

Manufacturer of **ENGINE LATHES**, from twelve (12) to forty-eight (48) inches swing; **Hand Lathes; Wood Turning Lathes; Vertical Drills; Boring Mills; Tapping and Centring Machines; Screw Press** for Mandrels; **Grindstone Boxes.**

Cor. North-Fifteenth St. and Pennsylvania Ave.

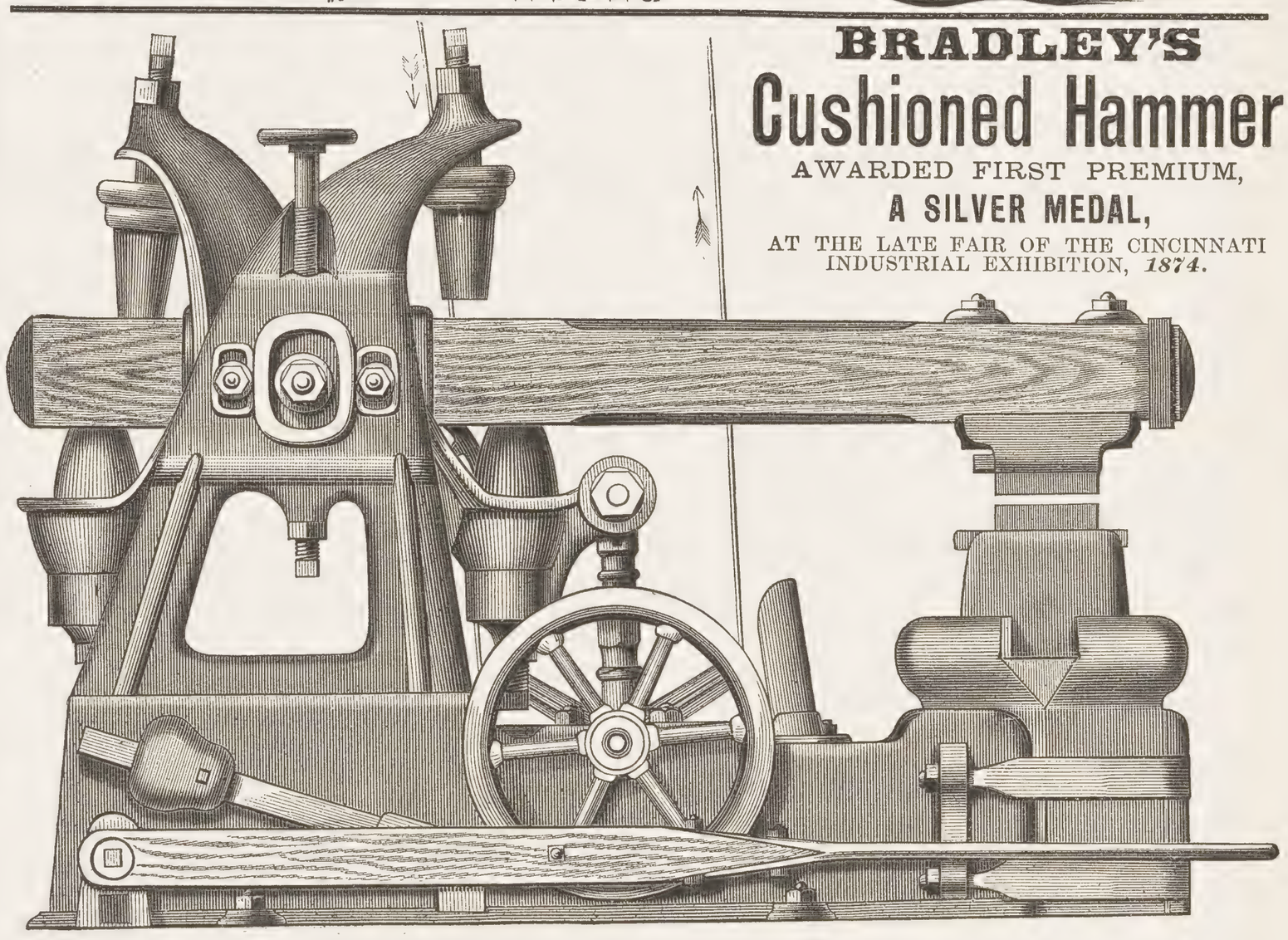
PHILADELPHIA.



BRADLEY'S

Cushioned Hammer

AWARDED FIRST PREMIUM,
A SILVER MEDAL,
AT THE LATE FAIR OF THE CINCINNATI INDUSTRIAL EXHIBITION, *1874.*



This Hammer has many valuable improvements made useful in the device for cushioning the blow, thereby relieving all th working parts from that jar and concussion which is the destroying element of other helve hammers. It is made

Adjustable in Line of Action, Length of Stroke Rapidity of Motion, and Weight of Blow,

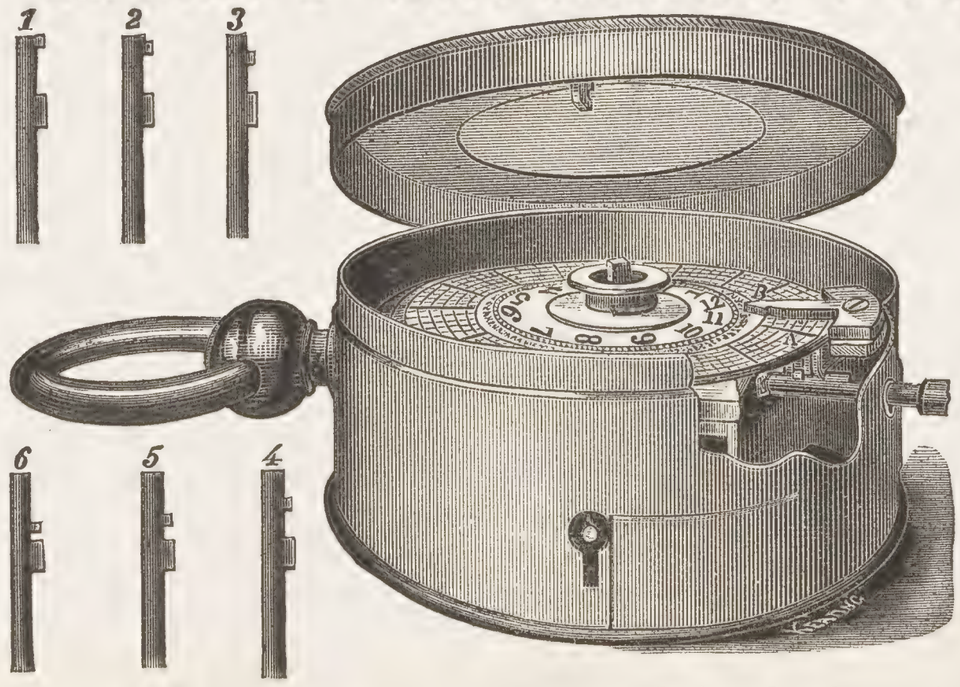
all of which are controlled at the will of the operator. They have

Larger capacity, cost less, are more durable, take up less room, do more and better work at less expense for power than any other Hammer in use.

We guarantee them fully as recommended. For particulars, address

BRADLEY MANUFACTURING CO., Syracuse, N. Y.

BUERK'S WATCHMAN'S TIME DETECTOR.



Important for all large corporations and manufacturing concerns; capable of controlling, with the utmost accuracy, the motions of a watchman, as the same reaches different stations of his beat. Send for Circular.

J. E. BUERK,
P. O. BOX 979,
84 Washington St., Boston, Mass.

N. B.—In the suit against *Imhaeuser & Co.*, a decree was given, June 10th, 1874, granting an injunction against them, and awarding an account of damages for infringing on the Patent of Buerk's Watchclock. The public is hereby cautioned not to purchase Watchman's Time Detectors infringing on Buerk's Patents.

In sending for Circular or ordering the above, please mention this paper.

Car Manufacturers.

Allison, W. C. & Sons	Philadelphia Pa.
Anderson, J. R. & Co	Richmond, Va.
Allegheny Car & Transportation Co	Swissvale, Pa.
Altoona Manufacturing Co	Altoona, Pa.
Adrian Car Co	Adrian, Mich.
Arlington Car Manufacturing Co	Arlington, Vt.
Barney & Smith Manufacturing Co	Dayton, Ohio.
Baker, Jackson & Co	Latrobe, Pa.
Bellefonte Car Manufacturing Co	Bellefonte, Pa.
Billmeyer & Smalls	York, Pa.
Bradley, Osgood	Worcester, Mass.
Bridgeport Car-Works	Bridgeport, Pa.
Brill, J. G. & Co	Philadelphia, Pa.
Buffalo Car Co	Buffalo, N. Y.
Canada Car Co	Toronto, Canada.
Canda, F. E. & Co	Chicago, Ill.
Cape Fear Building Co	Abbottsburg, N. C.
Cartersville Car Co	Cartersville, Ga.
Central Car & Manufacturing Co	Jackson, Mich.
Clendenning, W. W	Montreal.
Cummings Car-Works	Jersey City, N. J.
Connellsville Machine and Car Co	Connellsville, Pa.
Corunna Car Co	Corunna, Mich.
De Pere Iron-Works	De Pere, Wis.
Detroit Car-Works	Detroit, Mich.
Detroit Car and Manufacturing Co	Detroit, Mich.
Dawson Manufacturing Co	Dawson, Ga.
Dickey, Neill & Co	Toronto.
Dickson Manufacturing Co	Scranton, Pa.
Erie Car-Works	Erie, Pa.
Elmira Car-Works	Elmira, N. Y.
Frederick & Co	Catasauqua, Pa.
Freas Brothers & Thornton	Berwick, Pa.
Fremont Car Co	Fremont, Ohio.
Gardner, F. & Co	Carlisle, Pa.
Gill, John L	Columbus, Ohio.
Gilbert, Bush & Co	Troy, N. Y.
Goold, James & Co	Albany, N. Y.
Goodrich Car Co	Augusta, Ga.
Hannibal Car Works	Hannibal, Mo.
Haskell & Barker Car Co	Michigan City, Ind.
Harrisburg Car Manufacturing Co	Harrisburg, Pa.
Heathcote, Herbst & Co	Glen Rock, Pa.
Hamilton, William & Son	Toronto.
Harlan & Hollingsworth Co	Wilmington, Del
Herrick Car-Works	Oswego, N. Y.
Huntingdon Car-Works	Huntingdon, Pa.
Indiana Car Co	Cambridge City, Ind.
Jackson & Sharp Co	Wilmington, Del.
Jackson & Woodin Manufacturing Co	Berwick, Pa.
Jones, J. M. & Co	West-Troy, N. Y.
Kimball Manufacturing Co	San Francisco, Cal.
Keith, H. T. & I. N	W. Sandwich, Mass.
Laporte Car Manufacturing Co	Laporte, Ind.
Lombard, Thomas	Augusta, Me.
Lebanon Manufacturing Co	Lebanon, Pa.
Lehigh Car Manufacturing Co	Stemton, Pa.
Litchfield Car Manufacturing Co	Litchfield. Ill.
Mansfield Machine-Works	Mansfield, Ohio.
Michigan Car Co	Detroit, Mich.
McNairy, Claflen & Co	Cleveland, Ohio
Murray, Dougall & Co	Milton, Pa.
McVay, Walker & Co	Braddock's Field, Pa
Mowry Car and Wheel Works	Cincinnati, O.
Middletown Car & Manufacturing Co	Middletown, Pa.
Missouri Car and Foundry Co	St. Louis, Mo.
Myers, H. S. & Co. (small cars)	York, Pa.
National Car Co	St. Albans, Vt.
New-Haven Car Co	New-Haven, Ct.
Niblo, James M	Conshohocken, Pa.
Ohio Falls Car Co	Jeffersonville, Ind
Ontario Car Co	London, Ont.
Oxford Co-operative Car Co	Oxford, Pa.
Patten Car-Works	Bath, Maine.
Peabody & Crangle Bro's	Calais, Me.
Peters, Simon	Quebec.
Petersburg Car Co	Petersburg, Va.
Piqua Car and Agricultural Works	Piqua, Ohio.
Pittsburg Car-Works	Pittsburg, Pa.
Pittsburg and McKeesport Car Co	McKeesport, Pa.
Pittsburg Car and Locomotive Co	Pittsburg, Pa.
Portland Co	Portland, Me.
Pullman Car Co	Chicago.
Peregoy, J. H	Houston, Texas.
Ranlet Car Manufacturing Co	Laconia, N. H.
Russell & Co	Massillon, Ohio.
Sands, William L	Pottstown, Pa.
Schall, Michael	York, Pa.
Schenectady Car-Works	Schenectady, N. Y.
Shaaber & Johnston	Reading, Pa.
Southern Car-Works	Independence, La.
South-Western Car Co	Jeffersonville, Ind.
Shoenberger & Bryant	Duluth, Minn.
Seath & Hager	Terre Haute, Ind.
St. Charles Manufacturing Co	St. Charles, Mo.
Stephenson, John & Co	New-York, N. Y.
Star Mining & Manufacturing Co	Henderson, Ky.
Taunton Car Co	Taunton, Mass
Tredegar Co	Richmond. Va.
Vigo Foundry and Terre Haute Car-Works	Terre Haute, Ind.
Watsontown Car Co	Watsontown, Pa.
Wharton, Thomas J	Brunswick, Ga.
Whittaker, Phillips & Co	Toledo, Ohio.
Wason Manufacturing Co	Springfield, Mass
Weimer, P. L. & Bros	Lebanon, Pa.
Wyoming Valley Manufacturing Co	Wilkesbarre, Pa.
Wells, French & Co	Chicago, Ill.
Wilmington Car-Works	Wilmington, Del.

Car-Wheel Manufacturers.

Albany Car-Wheel Works	Albany, N. Y.
American Paper Car-Wheel Co	Hudson, N. Y.
Atlantic Iron-Works	Portsmouth, Va.
Baltimore Car-Wheel Foundry Co	Baltimore. Md.
Barnum Richardson Manufacturing Co	Chicago, Ill.
Barnum Richardson Co	Lime Rock, Conn.
Barney & Smith Manufacturing Co	Dayton, Ohio.
Bass & Hanna	Fort Wayne, Ind.
Blanchard & Arnold	Milwaukee, Wis.
Boston Car-Wheel Co	Camb'gep't, Mass.
Bowler, Mayer & Brayton	Cleveland, Ohio.
Cayuta Wheel & Foundry Co.,	Waverly, N. Y.
Chicago Car-Wheel Co	Chicago, Ill.
Davenport, Fairbairn & Co	Erie, Pa.
Dawson Manufacturing Co	Dawson, Ga.
Detroit Car-Wheel Works	Detroit, Mich.
Ensign Manufacturing Co	Huntingdon. W. Va.
Fulton Foundry Co	Cleveland, Ohio.
Gill, John L. Jr	Allegheny City, Pa.
Green's Car-Wheel Manufacturing Co	St. Louis, Mo.
Hamtramck Car-Wheel Works	Detroit, Mich.
Haskell & Barker Car Co	Michigan City, Ind.
Harrisburg Car Manufacturing Co	Harrisburg, Pa.
Heartt, Jonas S. & Co	Troy, N. Y.
Jackson & Woodin	Berwick, Pa.
John L. Gill	Columbus, Ohio.
Lehigh Car-Wheel & Axle Works	Catasauqua, Pa.
Litchfield Car M'f'g Co	Litchfield, Ill.
Lobdell Car-Wheel Works	Wilmington, Del.
London Car-Wheel Co	London, Can.
Louisville Car-Wheel & Railway Supply Co	Louisville, Ky.
Middlebrook & Mack	Oswego, N. Y.
Missouri Car and Foundry Co	St. Louis, Mo.
Mowry Car and Wheel Works	Cincinnati, Ohio.
Nash, John & Co	Cincinnati, Ohio.
Ohio Falls Car Co	Jeffersonville, Ind.
Parker & Bailey	St. Paul, Minn.
Pettengill, Glass & Co	Cleveland, Ohio.
Ramapo Wheel & Foundry Co	Ramapo, N. Y.
Russell, B. F. & Co	Chicago, Ill.
Rutland Foundry & Machine Co	Rutland, Vt.
Sterling Car-Wheel Foundry	Columbus, Ohio.
Scoville, J. & N. C	Buffalo, N. Y.
St. Louis Car-Wheel Co	St. Louis, Mo.
Taylor Iron Works	High Bridge, N. J.
Thompson, Duglas	Bordentown, N. J.
Tredegar Company	Richmond, Va.
Toronto Car-Wheel Co	Toronto, Can.
Washburn, Hunts & Co	Jersey City, N. J.
Washburn Car-Wheel Manufacturing Co	Worcester, Mass.
Wason Manufacturing Co	Springfield, Mass.
Whitney A. & Sons	Philadelphia, Pa.
Woodbury & Company	E. Cambr'ge, Mass.
Wyoming Valley Manufacturing Co	Wilkesbarre, Pa.

Locomotive Builders.

Baldwin Locomotive Works	Philadelphia, Pa
Brooks Locomotive Works	Dunkirk, N. Y.
Danforth & Cooke	Paterson, N. J
Dawson & Baily (light locomotives)	Connellsville, Pa
Dickson Manufacturing Co	Scranton, Pa.
Grant Locomotive Works	Paterson, N. J.
Hinckley Locomotive Works	Boston, Mass.
Manchester Locomotive Works	Manchester, N. H
Mason, William	Taunton, Mass.
McKay Iron and Locomotive Works	Jersey City, N J.
Portland Company	Portland, Me.
Porter, Bell & Co. (light locomotives)	Pittsburg, Pa.
Pittsburg Locomotive Works	Pittsburg, Pa.
Rogers Locomotive Works	Paterson, N. J.
Rhode Island Locomotive Works	Providence, R. I.
Schenectady Locomotive Works	Schenectady, N. Y
Taunton Locomotive Works	Taunton, Mass.

BUSS & BRADLEY,

Manufacturers of and Dealers in all kinds of

WOOD AND IRON WORKING

MACHINERY,

Steam Engines and Mechanical Supplies.

Locomotive and Car Builders' Machinery a Specialty.

No. 59 SUDBURY STREET, BOSTON.

SEND FOR PRICE-LIST.

T. S. RAY. C. T. HAM. C. A. MARVIN. W. H. BONNELL.

Buffalo Steam Gauge & Lantern Co.

MANUFACTURERS OF THE

BUFFALO PRESSURE AND VACUUM GAUGES

LOCOMOTIVE HEAD LIGHTS,

TAIL LAMPS,

REVOLVING SIGNALS,

PORTER HAND LAMPS,

TARGET AND GAUGE LAMPS, ETC.

DEALERS IN

HEAD-LIGHT GLASS AND CHIMNEYS.

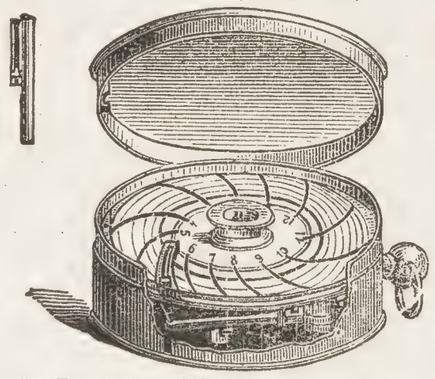
Manufactory and Office, corner Washington and Perry Streets,

BUFFALO, N. Y.

Reflectors Re-plated, Gauges of all kinds and Locomotive Balances Repaired at Short Notice.

WATCHMAN'S IMPROVED TIME DETECTORS.

U. S. Patents, December 28, 1869; April 22, 1873; August 2, 1874; October 20, 1874; November 10, 1874.



These Detectors are the latest and most complete invented. They are portable and reliable time-pieces and guaranteed in every case to be perfect. They can be cleaned and repaired by any watch-maker, and are invaluable and indispensable to all establishments that employ watchmen, as it enables them to check and control their movements. **Price,** with 12 keys (for 12 stations), **$75.**

N. B.—We will protect our customers against all claims of other patentees, and especially against J. E. Buerk, of Boston, Mass., who has never brought suit for any alleged infringement by clocks made under the above-named patents, and by us offered for sale. Send for Circular to

IMHAEUSER & CO.,

212 Broadway, P. O. Box 4798, *NEW-YORK.*

PHELPS, DODGE & CO.,

Cliff St., between John and Fulton,

NEW-YORK,

IMPORTERS AND DEALERS IN

Tin and Roofing Plates,

OF ALL SIZES AND KINDS.

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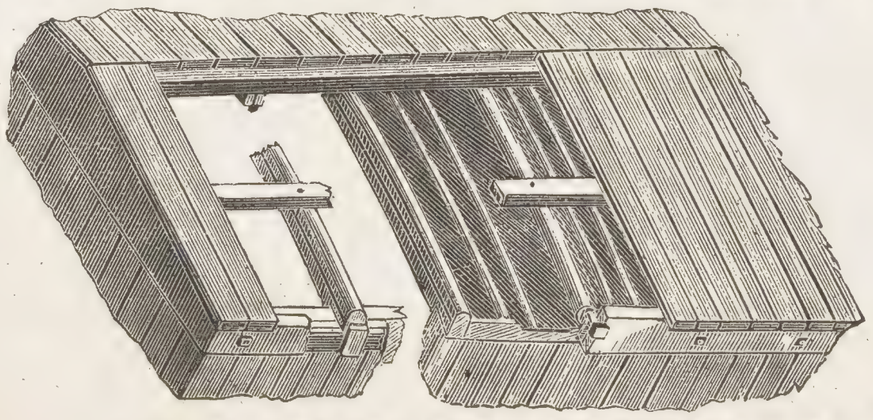
MANUFACTURERS OF

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THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* Mechanical Engineer. † Mechanical Superintendent. ‡ General Master-Mechanic. †† Gen. Master Car-Builder. § Master of Machinery. ‖ General Foreman. ** Superintendent of Machinery. §§ Superintendent of Motive Power and Machinery. ‖‖ Superintendent of Rolling Stock. ‡‡ Supt. Cars and Buildings.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
A			
Adirondack	Jacob Myers	James J. Traver	Saratoga, N. Y.
Alabama Central	E. M. Smith	E. M. Smith	Selma, Ala.
Albany & Susquehanna	R. C. Blackall	R. C. Blackall	Albany, N. Y.
Alexandria, Nebraska & Iowa	Geo. Q. Adams		Alexandria, Mo.
Arkansas Central	A. H. Johnson	A. H. Johnson	Helena, Ark.
Atchison, Topeka & Santa Fe	H. V. Farris		Topeka, Kan.
Atchison & Nebraska	Selah Williams		Atchison, Kan.
Alabama & Chattanooga	T. H. Kennedy		Chattanooga, Tenn.
Allegheny Valley	G. W. Glass	R. Gunning	Pittsburg, Pa.
Atlanta & Richmond Air-Line	G. H. Gramling		Atlanta, Ga.
Atlanta & West-Point	Wm. Rushton		Atlanta, Ga.
Atlanta & West-Point		R. D. Cole	Newnan, Ga.
Atlantic & Gulf	§Chas. Collins	P. N. Raynal	Savannah, Ga.
Atlantic & North-Carolina	E. J. Clayton	E. J. Clayton	New-Berne, N. C.
Atlantic & Great Western	‡William Fuller	D. S. Dockstader	Meadville, Pa.
Atlantic & Great Western	J. A. Cooper	††J. H. F. Wiers	Meadville, Pa.
Atlantic & Great Western	N. Wright	W. G. Huggard	Cleveland, Ohio.
Atlantic & Great Western		S. V. Smith	Kent, Ohio.
Atlantic & Great Western	William Hill	J. W. Holmes	Galion, Ohio.
Atlantic & Great Western	‖J. B. Miller		Shenango, Pa.
Atlantic & Pacific & Missouri Pacific	§§John Hewitt	J. Hodge	St. Louis, Mo.
Atlantic & Pacific & Missouri Pacific	‖R. D. Grant		St. Louis, Mo.
Atlantic, Mississippi & Ohio			
Norfolk & Petersburg Division	J. S. Whitworth	J. S. Whitworth	Norfolk, Va.
South Side of Virginia "	J. T. Robinett	J. T. Robinett	Petersburg, Va.
Virginia & Tennessee "	F. Sterk	W. A. Morgan	Lynchburg, Va.
Virginia & Kentucky "			
B			
Baltimore & Ohio	§John C. Davis	J. S. Shryack	Baltimore, Md.
Baltimore & Ohio	A. J. Cromwell	James H. Miller	Baltimore, Md.
Baltimore & Ohio	Wm. Edwards		Martinsburg, Va.
Baltimore & Ohio	S. A. Silver		Piedmont, Va.
Baltimore & Ohio	E. W. Lippencott	H. Longest	Grafton, W. Va.
Baltimore & Ohio	E. L. Weisgarber	‖C. Ditman	Wheeling, W. Va.
Central Ohio Division	Alex Platt		Zanesville, O.
S'dusky, Mans., & New'k Div.	Wm. Y. Johnson		Sandusky, O.
Central Ohio Division	§Sam. Houston		Newark, O.
Central Ohio Division	James Stewart		Newark, O.
Central Ohio Division	O. B. Perkins		Columbus, O.
Chicago Division	Geo. Wilson		Chicago, Ill.
Bangor, Old Town & Milford	J. B. Peckham	John H. Brown	Bangor, Me.
Bangor & Piscataquis	Horace Penny	J. W. Comins	Old Town, Me.
Bellefonte & Snow-Shoe	H. D. Landis	H. D. Landis	Bellefonte, Pa.
Belvidere & Delaware	R. McDowell	John Silvers	Lambertville, N. J.
Boston & Albany	Wilson Eddy	F. D. Adams	Springfield, Mass.
Boston & Albany	A. B. Underhill		Boston, Mass.
Boston & Albany		W. E. Chamberlain	Allston, Mass.
Boston, Barre & Gardner	John Loyer		Worcester, Mass.
Boston & Providence	George Richards	John Lightner	Roxbury, Mass.
Boston, Clinton & Fitchburg	John Webster	Samuel Stevens	Fitchburg, Mass.
Boston, Concord & Montreal	Ralph Adams	M. R. Elkins	Lake Village, N. H.
Boston & Maine	F. A. Waitt		Boston, Mass.
Boston & Maine		D. C. Richardson	Lawrence, Mass.
Boston, Lowell & Nashua	J. F. Crockett	T. G. Davis	Boston, Mass.
Boston, Lowell & Nashua		S. A. Davis	Nashua, N. H.
Brockville & Ottawa	H. J. Marshall	H. J. Marshall	Brockville, Can.
Brunswick & Albany	M. Thornton		Brunswick, Ga.
Burlington & Missouri River in Neb.	J. Christiansen	J. Christiansen	Plattsmouth, Neb.
Burlington, Cedar Rapids & Minn.	R. W. Bushnell	R. W. Bushnell	Cedar Rapids, Iowa.
Buffalo, New-York & Phila.	Allen Vail.		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. J. Bookhammer	John Monks	Oil City, Pa.
C			
Cairo & Vincennes	R. Williams		Cairo, Ill.
California Pacific	A. J. Stevens	D. Rutherford	So. Vallejo, Cal.
Camden & Amboy	F. B. Stevens		Hoboken.
	T. T. Kerr	E. Lockwood	Bordentown, N. J.
	Thomas Single		South-Amboy.
Camden & Atlantic	Rufus Hill	S. Wills	Camden, N. J.
Canada Southern and Branches	‡‡C. E. Benton	††C. E. Benton	St. Thomas, Canada.
Carolina Central	W. A. Gill	Thos. Myers	Laurinburg, N. C.
Catawissa	Wm. Ellis	C. D. Ellis	Catawissa, Pa.
Catasauqua & Foglesville	Thomas Evans	Chas. J. Holbach	Catasauqua, Pa.
Central of Georgia	D. D. Arden	C. C. Millar	Savannah, Ga.
Central of New-Jersey	*T. W. Peeples	George Hackett	Elizabethport, N. J.
Lehigh & Susquehanna Div.	L. C. Brastow	L. C. Brastow	Wilkesbarre, Pa.
Central Branch Union Pacific	Geo. C. Benedict		Atchison, Kansas.
Central R. R. of Iowa		T. L. Seevers	Marshalltown, Iowa.
Central R. R. of Iowa	F. B. Woodruff.		Eldora, Iowa.
Central Pacific	A. J. Stevens	Benjamin Welch	Sacramento, Cal.
Western Division	Geo. D. Welch	J. J. Lawler	Oakland Cal.
Visalia Division	S. Johnson		Lathrop, Cal.
Sacramento Division	M. W. Cooley		Rocklin, Cal.
Sacramento Division		Nat. Webb	Truckee, Cal.
Truckee Division	James Velsir	Wm. McPherson	Wadsworth, Nev.
Humboldt Division	H. L. Stevenson	H. B. Hartsman	Carlin, Nevada.
Salt Lake Division	W. H. McKenzie	G. J. Turner	Ogden, Utah.
California Pacific Division	D. Rutherford	D. Rutherford	Vallejo, Cal.
Central Vermont	J. M. Foss	J. M. Foss	St. Albans, Vt.
Harlem Extension Div.	C. S. Clapp	C. S. Clapp	Bennington, Vt.
New-London Northern Division	J. W. Dow	S. W. Caulkins	New-London, Ct.
Ogdensburg & L. Champlain Div.	William A. Short	J. R. Ames	Malone, N. Y.
Rutland Division	W. L. Short		Rutland, Vt.
Charleston & Savannah	H. T. Calder		Charleston, S. C.
Chesapeake & Ohio	W. G. Freeman	J. N. King	Richmond, Va.
Chesapeake & Ohio	§T. J. Hamer	H. C. Bassinger	Huntingdon, W. Va.
Cheraw & Darlington	D. W. Haines	A. M. Corrie	Florence, S. C.
Champlain Trans. Co	H. T. Calder		Burlington, Vt.
Cheshire & Ashuelot	F. A. Perry	F. A. Perry	Keene, N. H.
Charlotte, Columbia & Augusta	Robert King	J. C. Troeger	Columbia, S. C.
Chicago & Pacific	A. S. Gurnee		Chicago, Ill.
Chicago & Lake Huron			
Eastern Division	E. Hollis		Port Huron, Mich.
Western Division	W. C. Faulkner		Battle Creek, Mich.
Chicago & North-Western	§Geo. W. Tilton	William Campbell	Chicago, Ill.
Wiscon. Mad. & Mill. Divis		Wm. Campbell	Chicago, Ill.
Wiscon. Mad. & Mill. Divis		Henry Hull	Fond du Lac, Wis.
Galena Division		Hugh Gray	Chicago, Ill.
Iowa Division	C. C. Elliott	Richard Wharton	Clinton, Iowa.
Peninsula Division	Geo. White		Escanaba, Mich.
Chicago & Alton	John A. Jackman	R. Reniff	Bloomington, Ill.
Chicago, Burlington & Quincy	‡Wm. Wilson	††W. W. Wilcox	Aurora, Ill.
Galesburg Division	James Lamb	H. J. F. Small	Galesburg, Ill.
Creston Division	Joel West		Creston, Iowa.
Burlington Division	John Bassler		Burlington, Iowa.
Chicago, Clinton & Dubuque	P. R. Sutton		Dubuque, Iowa.
Chicago, Dubuque & Minnesota	P. R. Sutton		Dubuque, Iowa.
Chicago, Rock Island & Pacific	T. B. Twombly	B. K. Verbryck	Chicago, Ill.
Chicago & Michigan Lake Shore	T. J. Hartswell	D. Sutherland	St. Joseph, Mich.
Chicago, Danville & Vincennes	J. B. Morgan		Danville, Ill.
Chicago, Milwaukee & St. Paul			
La Crosse & P. Du Chien Div.		Wm. E. Kittredge	Milwaukee, Wis.
Northern Div.		John Bailie	Milwaukee, Wis.
Iowa & Minn. Div.	J. Pettee	J. Pettee	Minneapolis, Minn.
Hastings & Dakota Division	C. C. Clements		Hastings, Minn.
Chicago & Iowa	H. S. Bryan		Aurora, Ill.
Cincinnati, Wabash & Michigan	E. M. Porter		Wabash, Ind.
Cincinnati, Hamilton & Dayton	James Eckford	W. H. H. Allison	Cincinnati, Ohio.
Indianapolis Division	Edward Moore		Indianapolis, Ind.
Cincinnati, Lafayette & Chicago	Charles E. Gore		Lafayette, Ind.
Cincinnati & Muskingum Valley	Leroy Kells	Daniel Jewell	Lancaster, Ohio.
Cincinnati, Sandusky & Cleveland	J. M. Sanborn		Sandusky, Ohio.
Cleveland, Col., Cin. & Indianapolis	‡L. S. Young	††William F. Smith	Cleveland, Ohio.
Indianapolis Division	A. R. McAlpine		Galion, Ohio.
Indianapolis Division.		R. Attridge	Indianapolis, Ind.
Cincinnati Division	D. Carmichael	D. Carmichael	Delaware, Ohio.
Columbus Division	F. G. Kaufholz	Wm. Cleve	Cleveland, Ohio.
Cleveland & Pittsburg	N. E. Chapman	A. Steinbrunner	Cleveland, Ohio.
Cleveland, Mt. Vernon & Delaware	J. W. Holloway	J. W. Holloway	Akron, Ohio.
Cleveland, Tuscarawas Val. & Wheeling	W. F. Turreff		Cleveland, O.
Cobourg, Peterboro & Marmosa	Wm. Polson		Cobourg, Canada.
Columbus, Chicago & Indiana Central	(See Pitts. Cinn. & St. Louis)		
Columbus & Hocking Valley	H. S. Wallace	H. S. Wallace	Columbus, Ohio.
Concord	Chs. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Portsmouth	C. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Claremont	J. N. Lander	A. Langmaid	Concord, N. H.
Connecticut River	§Wm. H. Stearns		Springfield, Mass.
Connecticut Valley	C. W. Hollister	N. A. Smith	Hartford, Ct.
Connecticut Western	N. Slingland		Hartford, Ct.
Contoocook River			Concord, N. H.
Conn. & Passumpsic Rivers	Geo. Kilby		Lyndonville, Vt.
Corning, Cowanesque & Antrim	O. C. Patchell	O. C. Patchell	Corning, N. Y.
Cumberland Valley	A. S. Hull	C. W. Nitterhouse	Chambersburg, Pa.
Cumberland & Pennsylvania	W. L. Jordan	Nathan Binnix	Mt. Savage, Md.
D			
Dakota Southern	Jas. Whitney	A. A. Meckling	Yankton, Dak.
Danbury & Norwalk	Charles A. Craig	C. A. Craig	Danbury, Ct.
Davenport & St. Paul	James Russell		Davenport, Iowa.
Dayton & Union	A. J. Keenan	J. F. Feicht	Dayton, Ohio.
Dayton & Michigan	John Black	W. H. H. Allison	Cincinnati, Ohio.
Delaware, Lackawanna & Western	Walter Dawson	Robert McKenna	Scranton, Pa.
Morris & Essex Division	W. H. Lewis	L. S. Barber	Hoboken, N. J.
Denver & Rio Grande	John Greenwood		Denver, Col.
Detroit, Ft. Wayne & Logansport	W. A. Carpenter		Bankers, Mich.
Detroit & Milwaukee	C. M. Hanson		Detroit, Mich.
Detroit, Lansing & Lake Michigan	Tho. E. Roberts		Ionia, Mich.
Delaware & Hudson Canal Co.	‖‖R. C. Blackall		Albany, N. Y.
Dorchester & Delaware			Cambridge, Md.
Dubuque South-Western	James Rollo	James Rollo	Farley, Iowa.
Dutchess & Columbia	W. G. Vanbuskirk	H. A. Webster	Fishkill, N. Y.
Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett	Dunkirk, N. Y.
E			
Eastern & Maine Central		J. P. Somerby	Salem, Mass.
Eastern & Maine Central	John Thompson		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L. Weaver	Riverton, Ky.
East-Tennessee, Virginia & Georgia	C. A. Hodge		Knoxville, Tenn.
Erie Railway	§§Frank K. Hain		Susquehanna, Pa.
Erie Railway	Robert Wallace		Susquehanna, Pa.
Erie Railway	V. Blackburn		Jersey City, N. J.
Erie Railway	F. M. Wilder	M. Wilder	Buffalo, N. Y.
Erie Railway	J. W. Chapman	J. W. Chapman	Hornellsville, N. Y.
Erie Railway		‖D. B. Goodell	Elmira, N. Y.
Erie Railway		‖J. B. Hill	Jersey City, N. J.
Erie Railway	J. Van Vechten	‖J. Van Vechten	Port Jervis, N. Y.
Erie Railway	A. T. Back		Rochester, N. Y.
Erie & Pittsburg	—G. J. Parkin.	G. J. Parkin	Erie, Pa.
European & North Am. (of Maine)	A. O. Bailey	J. H. Brown	Oldtown, Maine.
Evansville & Crawfordsville	John L. White	Joseph Stiker	Evansville, Ind.
Evansville, Terre Haute & Chicago	§§Wm. Riley, Jr.		Terre Haute, Ind.
F			
Fitchburg	Geo. A. Cooledge	Enos Varney	Charlestown, Mass.
Fitchburg & Worcester	John Webster	Samuel Stevens	Fitchburg, Mass.
Flint & Pere Marquette	Sanford Keeler	‖R. B. More	East-Saginaw, Mich.
Florida	Ezra Gray	G. Hernandez	Fernandina, Fla.
Flushing & North Shore	Wm. La Suer	C. Wilkinson	Hunter's Point, L. I.
Fort Wayne, Jackson & Saginaw		Lewis Colburn	Jackson, Mich.
G			
Galveston, Harrisburg & San Antonio	Palmer Cady		Harrisburg, Texas.
Galveston, Houston & Henderson	Jno. G. Coulon	Wm. Macbeth	Galveston, Texas.
Georgia	William Hardman	T. M. Preval,	Augusta, Ga.
Gilman, Clinton & Springfield	W. B. McKenna		Springfield, Ill.
Grand Tower & Carbondale.	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk		Warren Noyes	Gorham, Me.
Grand Trunk.	†Herbert Wallis	Wm. McWood	Montreal, Canada.
Grand Trunk.			Sherbrooke, Can.
Grand Trunk.		B. J. Mitchell	Portland, Me.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne, Ind.
Great Western of Canada	†Wm. A. Robinson	F. Childs	Hamilton, Canada.
Green Bay & Lake Pepin.	J. H. Erwin		Green Bay, Wis.
Greenville & Columbia	R. H. Anderson	R. H. Anderson	Helena, S. C.
H			
Hackensack & New-York.	Abra'm Angausen		Hackensack, N. J.
Hanover Branch	John J. Bingley	Henry Britcher	Hanover, Pa.
Hannibal & St. Joseph	**Jno. MacKenzie		Hannibal, Mo.
Hartford, Providence & Fishkill	Edwin Garfield	V. D. Perry	Hartford, Ct.
Housatonic	C. R. Morris.	J. J. Ferris	Falls Village, Ct.
Houston & Texas Central	L. C. Noble	James McGee	Houston, Texas.
Houston & Texas Central		‖S. H. McElroy	Houston, Texas.
Huntington & Broad-Top Mountain	W. W. Coller	M. Tellerhoof	Saxton, Pa.
I			
Illinois Central	**S. J. Hayes	W. B. Snow	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia, Ill.
North Division	J. B. Edams		Amboy, Ill.
Iowa Division	Thomas W. Place		Waterloo, Iowa.
Illinois Midland	J. G. Clifford	G. Clifford	Paris, Ill.
Illinois & St. Louis.	James Hazen		Bellville, Ill.
Indianapolis, Cincinnati & Lafayette	J. S. Patterson	S. Griffith	Cincinnati, Ohio.
Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Indianapolis & St. Louis	A. J. Sanborn		Mattoon, Ill.
Indianapolis, Bloomington & Western	H. L. Cooper	A. J. Allen	Urbana, Ill.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ia.
International & Great Northern	R. B. Small		Palestine, Texas.
Intercolonial	Wm. Whitney	Edw. Shaffer	Moncton, N. B.
Iron	Perry Scott	Clem. Roetling	Ironton, Ohio.
Ithaca & Athens	F. A. Brown		Ithaca, N. Y.
J			
Jacksonville, Pensacola & Mobile	H. D. Kennedy		Jacksonville, Fla.
Jeffersonville, Madison & Indiana	Reuben Wells		Jeffersonville, Ind.
Junction & Breakwater	J. A. Maguire.		Lewes, Del.
K			
Kalamazoo, Allegan & Grand Rapids			Kalamazoo, Mich.
Kansas City, St. Joseph & Council Bluff	Wm. D. Rowley	Wm. D. Rowley	St. Joseph, Mo.
Kansas Central	Samuel Black		Leavenworth, Kan.
Kansas Pacific	**L. H. Waugh		Wyandotte, Kansas.
Denver Pacific Div.	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div.	**L. H. Waugh		Wyandotte, Kansas.
Junction City & Ft. Kearney Div	**L. H. Waugh		Wyandotte, Kansas.
Arkansas Valley Div	**L. H. Waugh		Wyandotte, Kansas.
Kentucky Central	J. R. Ledyard	J. L. Hackathorn	Covington, Ky.
Keokuk & Des Moines Valley	S. W. Wakefield	M. Sessions	Keokuk, Iowa.
King's Mountain	E. Thomas	E. Thomas	Chester, S. C.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Knox & Lincoln	§§E. R. Hamlin	Benj. Soule	Bath, Me.
Knoxville & Charleston			Knoxville, Tenn.
L			
Lackawanna & Bloomsburg	Chas. Graham	Chas. Graham	Kingston, Pa.
Lake Erie & Louisville	John Pero		Fremont, Ohio.
Lake Ontario Shore	Wm. Harris		Oswego, N. Y.
Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland, Ohio
Michigan Southern Division	Geo. W. Stevens		Elkhart, Ind.
" " "		S. S. Knapp	Adrian, Mich.
Toledo Division	J. M. Sanborn	Frank O. Bray	Norwalk, Ohio.
Erie Division	L. O. Gassett	J. Withyecombe	Cleveland Ohio.
Buffalo Division	W. L. Wallace	A. C. Robson	Buffalo, N. Y.
Lake Superior & Mississippi			St. Paul, Minn.
Lehigh Valley	John I. Kinsey		South-Easton, Pa.
Lehigh Valley	P. Hofecker	E. R. Brown	Weatherly, Pa.
Lehigh Valley	John Campbell	Mauch Chunk, Pa.	Delano, Pa.
Lehigh Valley	D. Clark		Hazleton, Pa.
Leavenworth, Lawrence & Gal	J. S. McCrum		Lawrence, Kansas
Little Rock & Fort Smith	D. R. Wing	D. R. Wing	Argenta, Ark.
London & Port Stanley			London, C. W.
Louisville, New-Albany & Chicago	Geo. Ruhlandt	Geo. Helfrich	New-Albany, Ind.
Long Island	Chs. A. Thompson	C. A. Thompson	Hunter's Point, L I.
Louisville, Cincinnati & Lexington	S. S. Pilson	S. S. Pilson	Louisville, Ky.
Louisville & Nashville	†Thatcher Perkins		Louisville, Ky.
Louisville & Nashville	D. P. Rennie	Isaac M. Owens	Louisville, Ky.
Louisville & Nashville	Jas. Montgomery		Bowling Green, Ky.
Nashville & Decatur Division	John Skidmore		Nashville, Tenn.
South & North Ala. Div.	Thos Jeffers	W. L. Gude	Birmingham, Ala.
South & North Ala. Div.	C. H. Beale		Montgomery, Ala.
Memphis & Ohio Div.	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Louisville, Paducah & So. Western	W. D. Robb	Frank Looney	Elizabethtown, Ky.
M			
Macon & Augusta			Macon, Ga.
Macon & Brunswick	R. Wagnon	R. Wagnon	Macon, Ga.
Macon & Western	D. M. Gogel	James A. Knight	Macon, Ga
Maine Central	J. W. Philbrick	J. W. Philbrick	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div	John Ellis	C. H. Kenison	Augusta, Me.
Maine Central Division	John F. Merrill.		Waterville Me.
Manchester & Lawrence	Chas. L. Eastman	M. W. Dickerman	Concord, N. H.
Marietta, Pittsburg & Cleveland	W. J. Adams		Marietta, Ohio.
Marietta & Cincinnati	E. Bosley	E. Bosley	Chillicothe, Ohio.
Marquette, Houghton & Ontonagon	C. J. Shellhorn	H. D. Lyons	Marquette, Mich.
Maryland & Delaware	Samuel Peters		Greensboro, Md.
Memphis & Little Rock	Tho. Rennell	P. Twitchell	Argenta, Ark.
Memphis & Charleston	A. Ross	A W. Drew	Memphis, Tenn.
Memphis & Charleston	H. N. Burford	Fabien Varin	Huntsville, Ala.
Mineral Point	Robert Hay	Robert Hay	Mineral Point, Wis.
Mineral Range	C. H. Fox		Hancock, Mich.
Mississippi & Tennessee	Geo. Haszinger	J. Riny	Memphis, Tenn.
Michigan Central	§§Geo. S. Chalender	Geo. S. Chalender	Jackson, Mich.
Michigan Central		‖Henry Whiting	Detroit, Mich.
Midland Pacific	A. C. Stiles		Lincoln, Neb.
Mississippi Valley & Western	J. S. Pickering		Canton, Mo.
Missouri, Iowa & Nebraska	Geo. Q. Adams		Alexandria, Mo.
Missouri, Kansas & Texas	T. G. Gorman		Parsons, Kan.
Missouri, Kansas & Texas		J. Townsend	Sedalia, Mo.
Missouri, Kansas & Texas	J. E. Wiggins		Hannibal, Mo.
Missouri River, Fort Scott & Gulf	John S. McCrum	Alex. Montier	Kansas City, Mo
Mobile & Montgomery	James McFarland	L. Barham	Montgomery, Ala
Mobile & Girard	C. D. Wall		Girard, Ala.
Mobile & Ohio		John McHugh	Mobile, Ala.
Mobile & Ohio	R. McDougal	I. T. Booth	Whistler, Ala.
Mobile & Ohio	B. S. Herring		Macon, Miss.
Mobile & Ohio	R. H. Briggs		Jackson, Tenn.
Montgomery & West-Point	J. McVey	J. T. Daniels	Montgomery, Ala
Montgomery & Eufaula	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Algiers, La.
Montreal Northern Colonization	§§C. G. C. Simpson		Montreal, Can.
N			
Nashville & Chattanooga	John U. Eastman	J. G. Sawyer	Nashville, Tenn.
Naugatuck	Henry Hanford	George W. Gray	Bridgeport, Ct.
New-Bedford	G. W. Reynolds	Robert Chase	Taunton, Mass.
New-Brunswick	P. Logan	C. M. Kinnon	Fredericton, N. B.
New-Brunswick & Canada	Tho. Armstrong	G. Houlton	St. Andrew's, N. B.
New-Haven & Northampton	Henry Fox	Henry Fox	New-Haven, Ct.
New-Jersey Midland			Wortendyke, N.J.
New-Jersey & New-York	A. J. Auryansen		Jersey City, N. J.
New-Jersey Southern	Rufus Blodgett.		Manchester, N. J.
New-Orleans & Ohio	John R. Jordan	John R. Jordan	Paducah, Ky.
New-Orleans, St. Louis & Chicago		‡‡J. D. Billings	McComb City, Miss.
New-Orleans, St. Louis & Chicago	§§L. H. Sellars		Water Valley, Miss.
New-Orleans, St. Louis & Chicago		G. H. White	McComb City, Miss.
New-Orleans & Mobile	§Josiah Bettis	W. J. Henderson	Mobile, Ala.
New-York, Kingston & Syracuse	A. Q. Mackenbush	G. Dikeman	Syracuse, N. Y.
New-York & Harlem	Wm. M. Strong	C. E. Garey	New-York.
New-York Central & Hudson River		††Leander Garey	New-York.
New-York Central Division	‡G. B. Van Vorst	D. Hoit	West-Albany, N. Y.
New-York Central Division	Henry Watkeys.		Syracuse, N. Y.
New-York Central Division	Amos Gould	James Leary	Rochester, N. Y.
New-York Central Division	Jas. Butman	Wm. Johnson	Buffalo, N. Y.
New-York Central Division	S. L. White	George Rowe	Niagara Falls, N. Y
Hudson River Division	‡Wm. Buchanan	E. A. Olmstead	New-York City.
Hudson River Division	R. Greenalch	J. J. Conaghty	E. Albany. N. Y.
New-York, Boston & Montreal	W. G. Van Buskirk	H. A. Webster	Dutchess Junc., N.Y
New-York & Oswego Midland	§§W. A. Dripps		Oswego, N. Y.
Eastern Division	J. Minchell		Middletown, N. Y.
Middle Division	Tho. Howard		Norwich, N. Y.
Northern Division	Edward Van Vleck	T. D. Day	Oswego, N. Y.
New-York & New-England	Geo. E. Boyden	Elias E. Pratt	Boston, Mass.
New-York, Providence & Boston	Jas. H. Anderson	Jas. H. Anderson	Providence, R. I.
New-York, New-Haven & Hartford	§§H. Kittendorf	James Denver	New-Haven, Ct.
New-York, New-Haven & Hartford	J. O. Chapman	F. Leppens	Hartford, Ct.
Northern Central	§§Howard Fry		Williamsport, Pa.
Northern Central		G. W. Demarest	York, Pa.
Northern New-Hampshire	James W. Lander	Albert Langmaid	Concord, N. H.
Northern of Canada	P. Clark.	P. Clark	Toronto, Can.
Northern Pacific	**H. A. Towne		St. Paul, Minn.
Minnesota Division	W. H. Lewis	W. S. Heathcote	Brainerd, Minn.
Lake Superior & Miss. Div	G. H. Smith	John Hill	St. Paul, Minn.
Dakota Division	C. W. Rossiter		Fargo, D. T.
Pacific Division	J. F. Curtis		Kalama, W. T.
North-Carolina	Rufus D. Wade	B. G. Sergeant	Co. Shops, N. C.
North-Louisiana & Texas	C. H. Tull		Monroe, La.
North-Lebanon		Henry B. Oves	Lebanon, Pa.
North-Pennsylvania	Franklin Roop	Franklin Roop	Philadelphia, Pa.
North-Eastern	D. W. Haines	A. M. Corrie	Florence, S. C.
Norwich & Worcester	Richard Colburn	G. R. Bentley	Norwich, Ct.
O			
Ohio & Mississippi		G. Hibbert	Cochran, Ind.
Ohio & Mississippi	‡J. D. W. Potts		Seymour, Ind.
Oil City & Pithole	George Thompson		Pithole, Pa.
Oil Creek & Alleghany River	H. J. Bookhammer	John Monks	Oil City, Pa.
Old Colony & Newport	J. K. Taylor	A. Gleason	Boston, Mass.
Oregon & California	§§J. Brandt		Portland, Oregon.
Owensburg & Russellville	J. R. Osborne		Owensburg, Ky.
P			
Paducah & Memphis	Alex. Forsyth		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Panama	Chas. E. Stewart		Aspinwall, N. G.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Pacific of Missouri	§§John Hewitt	E. Martin	St. Louis, Mo.
Pennsylvania	§§T. N. Ely		Altoona, Pa.
Pennsylvania	H. D. Garrett	I. W. Van Houten	W. Philadelphia, Pa.
Pennsylvania	E. L. Caum	Samuel W. Myers	Harrisburg, Pa.
Pennsylvania	G. W. Strattan	John P. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver.	R. S. Ramsey	Pittsburg, Pa.
New-Jersey Division	L. A. Bosdevex	E. Lockwood	Meadow Shops, N. J.
New-Jersey Division		David H. Baker	Jersey City, N. J.
West-Penn. Division	C. B. Street	M. H. Fales	Blairsville, Pa.
Peoria & Rock Island	Geo. Gregg		Peoria, Ill.
Peoria, Pekin & Jacksonville	R. F. Hurd	R. F. Hurd	Pekin, Ill.
Petersburg & Weldon	R. B. Andrews	Alex. Wright	Petersburg, Va.
Philadelphia, Wilmington & Baltimore	S. A. Hodgman	Wm. T. Worth	Wilmington, Del.
Philadelphia & Baltimore Central	S. D. Danfield	Samuel D. Danfield	Chester, Pa.
Philadelphia and Erie	Martin Walls		Sunbury, Pa.
	W. L. Forster		Renovo, Pa.
	W. L. Holman		Kane, Pa.
	W. T. Smith		Erie, Pa.
	§§Howard Fry		Erie, Pa.
Philadelphia & Reading	L. B. Paxson	Aaron Steinbach	Reading, Pa.
Germantown & Norris'n Div.	Jackson Richards		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis	E. Pierce	D. F. Andregg	Dennison, Ohio.
Pittsburg & Columbus Division		Thos. D. Furgusen	Steubenville, Ohio.
Little Miami Division		M. P. Ford	Columbus, Ohio.
Little Miami Division	J. H. Setchel		Cincinnati, Ohio.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlin	Columbus, Ohio.
Col., Cin. & Ind. Division	Geo. H. Prescott	Geo. H. Prescott	Logansport, Ind.
Pittsburg, Fort Wayne & Chicago	S. M. Cummings	John Marquis	Allegheny, Pa.
Pittsburg, Fort Wayne & Chicago	J. M. Boon.	Israel Lee	Fort Wayne, Ind.
Pittsburg, Fort Wayne & Chicago		J. J. Kirkland	Crestline, Ohio.
Pittsburg, Virginia & Charlston	W. Lininger		Pittsburg, Pa.
Pittsburg, Washington & Baltimore	§Wm. Stearns		Connellsville, Pa.
Pittsburg, Washington & Baltimore	J. E. Sampsel	J. M. Leach	Pittsburg, Pa.
Portland & Rochester	John G. Brady	John G. Brady	Portland, Me.
Portland & Oxford Central	Geo. W. Battles	Geo. W. Battles	Buckfield, Me.
Portland, Saco & Portsmouth	John Donnell		Portland, Me.
Port Royal	Geo. Riley	J. H. Milton	Augusta, Ga.
Port Hope, Lindsay & Beaverton	H. G. Taylor	H. G. Taylor	Port Hope, Can.
Portsmouth, Gt. Falls & Monmouth	James Tucker	E. Fall	Union Village, N.H.
Poughkeepsie & Eastern	John L. Driscoll	Jerry Wigg	Poughkeepsie, N. Y.
Providence & Worcester	Joseph Kelly	Olney L. Smith	Providence, R. I.
Providence, Warren & Bristol	Rufus Smith	J. Brightman	Bristol, R. I.
Q			
Quincy, Alton & St. Louis	J. O. Gravell	W. G. Gilbert	Quincy, Ill.
Quincy, Missouri & Pacific	W. F. Smith	W. F. Smith	Kirksville, Mo.
R			
Raleigh & Gaston	B. R. Harding	B. R. Harding	Raleigh, N. C.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Richmond, Fredericksburg & Potomac	H. Kuhn	W. H. Trainham	Richmond, Va.
Richmond, Danville & Piedmont	John McFarland	J. B. Vaughan	Richmond, Va.
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond, Va.
Richmond & York River.	C. H. Harris	J. L. Thompson	Richmond, Va.
Rive De Loup	P. A. Logan	C. R. McKinnin	Fredericton, N. B.
Rome, Watertown & Ogdensburg	Abram Klohs	H. H. Sessions	Rome, N. Y.
Rome, Georgia	O. W. Harbin	O. W. Harbin	Rome, Ga.
Rochester & Genesee Valley	M. E. Brown	M. Wilder	Buffalo, N. Y.
Rockford, Rock Island & St. Louis	Joseph Elder	T. F. Nolte	Beardstown, Ill.
S			
Saginaw Valley & St. Louis	W. S. Thompson		Saginaw, Mich.
San Antonio & Mexican Gulf	W. T. Bingham		Victoria, Texas.
Savannah & Charleston	P. J. Hutson	J. D. Murphy	Charleston, S. C.
Seaboard & Roanoke	§§M. M. Pendleton		Portsmouth, Va.
Selma & Gulf	Wm. T. Daughtrey		Selma, Ala.
Selma, Rome & Dalton		W. W. Peirce	Selma, Ala.
Selma, Marion & Memphis	Dolphus Gay		Marion, Ala.
Sheboygan & Fond du Lac	John Hickey	John Hickey	Sheboygan, Wis
Sioux City & Pacific	C. H. Foster		Missouri Val., Iowa.
Southern Pacific of California	J. P. Wilson	F. N. Bellisle	San Francisco, Cal.
South-Carolina	W. B. Smith	John Reed	Charleston, S. C.
Southern Central	Chas. G. Brown	H. Mooney	Auburn, N. Y.
Southern, of Long Island	Mark Brear	C. Wilkinson	Brooklyn, N. Y.
Southern Minnesota			Wells, Minn.
South-Western of Georgia	C. D. Wall.		Columbus, Ga.
South-Western of Georgia	D. M. Gogel	James A. Knight	Macon, Ga.
South Shore	Warren E. Ray		Cohasset, Mass.
South Side of Long Island	A. P. Doane	A. P. Doane	Williamsburg, L. I.
Spartanburg & Union	J. N. Benner	Jacob Rice	Union C. H., S. C.
Springfield, Athol & Northeastern	W. E. Granger		Springfield, Mass.
Stanstead, Shefford & Chambly	W. H. Smith		Waterloo, C. E.
Stockton & Ione		W. T. Hoyt	Stockton, Cal.
Stonington & Providence	J. H. Anderson	J. H. Anderson	Providence, R. I.
St. Croix & Penobscot	Edward Bolton	A G. Page	Milltown, Me.
St. Joseph & Denver City	E. Sleppy		St. Joseph, Mo.
St. Lawrence & Ottawa	Calvin Dame	Calvin Dame	Prescott, Canada.
St. Louis, Iron Mountain & Southern	O. A. Haynes	Oscar Doolittle	Carondelet, Mo.
Arkansas Division	L. Finlay.	L. Finlay	Little Rock, Ark.
St. Louis, Vandalia, T. Haute & Ind.	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Indianapolis Division	Wm. Riley		Terre Haute, Ind.
Vandalia Division	A. J. Sanborn.		Effingham, Ind.
St. Louis, Alton & Terre Haute.	**Beriah Warren		St. Louis, Mo.
St. Louis & South-Eastern	‖L. B. Salisbury		Mt. Vernon, Ill.
Nashville Division	‖E. M. Hamstone		Edgefield, Tenn.
St. Paul & Pacific	J. C. Monroe	T. W. Heathcote	St. Paul, Minn.
St. Paul & Sioux City	F. C. Butterfield	J. W. Lydic	Shakopee, Minn.
St. Louis, Kansas City & Northern	W. H. Selby	C. S. Buck	Moberly, Mo.
St. Louis, Lawrence & Western	J. A. Hagan		Lawrence, Kan.
Sullivan & Erie			Tonawanda, Pa.
Syracuse, Binghamton & New-York	H. H. Dawson	David Burling	Syracuse, N. Y.
Syracuse Northern	W. Garrison	L. W. Smith	Syracuse, N..
T			
Terre Haute & Indianapolis	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Tennessee & Pacific	William McKeand	William McKeand	Nashville, Tenn.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	J. A. Hanglin		Marshall, Texas
Tioga	Peres Bonny	D. H. Stratton	Blossburg, Pa.
Toledo, Peoria & Warsaw	W. O. Hewitt	R. M. Hemphill	Peoria, Ill.
Toledo, Wabash & Western	§J. B. Morse		Fort Wayne, Ind
Toledo, Wabash & Western	‖John C. Wills		Lafayette, Ind.
Toledo, Wabash & Western	Jacob Johann		Springfield, Ill.
Toledo, Wabash & Western		U. H. Kohler	Toledo, Ohio.
Toronto, Grey & Bruce.	Wm. Bowstead		Toronto, Can
Toronto & Nipissing	J. Haggus		Toronto, Canada.
Troy & Boston	Foster Church	R. V. Coon	Troy, N. Y.
U			
Union Pacific	§I. H. Congdon	‡‡Geo. E. Stevens	Omaha, Nebraska.
Eastern Division		‖A. M. Collett	Omaha, Neb.
Eastern Division		‖H. P. Makely	Grand Island, Neb.
Mountain Divison		‖Jno. E. Davis	Cheyenne, W. T.
Laramie Division		‖Floyd Heavaner	Laramie, W. T.
Western Division		‖C. A. Phipps	Evanston, U. T.
Utah Central	Thos. Pierpont	Thos. Pierpont	Salt Lake City.
Utica & Black River	John Bailey	David James	Utica, N. Y.
Utica, Chenango & Susquehanna	C. H. Brown		Utica, N. Y.
V			
Vermont & Massachusetts		Jacob Marsh	Fitchburg, Mass.
Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.
Virginia & Truckee	Wm. Bowker		Carson, Nev.
W			
Wash. City, Va. Midland & Gr. Southern	Jas. E. Waddey	J. T. Nalls	Alexandria, Va.
Washington & Ohio	Edward Dunn	Joshua Harrison	Alexandria, Va.
Welland	James Taylor	James Chase	St. Catharine, C. W.
Westchester & Philadelphia	John Moyer	N. Pawling	Philadelphia, Pa.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Western & Atlantic	John H. Flynn	Wm. Grambling	Atlanta, Ga.
Western Maryland	Wm. Lannan	J. H. Nussear	Union Bridge, Md.
Western North-Carolina	J. D. Hollister	J. D. Hollister	Salisbury, N. C.
Western R. R. N. C	M. W. Atkinson	M. W. Atkinson	Fayetteville, N. C.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
West-Feliciana	R. C. Brower	Wm. Grawling	Woodville, Miss.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
West-Wisconsin	Matt Ellis	J. C. Fischer	Hudson, Wis.
White Water Valley	A. W. Britton		Harrison, Ohio.
Wilmington, Columbia & Augusta	W. H. Turrintine		Wilmington, N. C.
Wilmington & Weldon	John Bissit	C. R. Clowe	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Wilmington & Reading	H. M. Missimer		Reading, Pa.
Winona & St. Peter	F. C. Ford	H. L. Preston	Winona, Minn.
Wisconsin Central	G. Campbell		Stevens' P't, Wis.
Worcester & Nashua	Albert Griggs.	Albert Griggs	Worcester, Mass

DIRECTORY
OF
Railway Superintendents and Purchasing Agents
THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director. ‡ Ass't. Gen. Supt. § Ass't Supt.

A

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Adirondack	C. H. Ballard		Saratoga, N. Y.
Alabama Central	John M. Bridges		Selma, Ala.
Albany & Susquehanna	*C. F. Young		Honesdale, Pa.
Allegheny Valley	J. J. Lawrence	John L. Awl	Pittsburg, Pa.
Arkansas Central	James A. Tappan		Helena, Ark.
Atchison, Topeka & Santa Fe	C. F. Morse	C. F. Morse	Topeka, Kansas.
Atchison & Nebraska	J. F. Barnard	J. F. Barnard	St. Joseph, Mo.
Atchison & Nebraska	*Geo. H. Nettleton		Kansas City, Mo.
Alabama & Chattanooga	C. H. Stanton	T. J. Carlile	Meridan, Miss.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Pittsburg, Pa.
Atlanta & Richmond Air Line	R. Y. Sage		Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	J. H. Holway	Meadville, Pa.
First Division	J. T. Odell		Meadville, Pa.
Second Division	A. L. Dunbar		
Third and Fourth Division	T. A. Phillips		Galion, Ohio.
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.

B

Baltimore & Ohio	Thos. R. Sharp	Benj. Williams	Baltimore, Md.
Central Ohio & Lake Erie Div.	Wm. Walker		Columbus, Ohio.
Baltimore & Potomac	Geo. C. Wilkins	A. W. Sumner	Baltimore, Md.
Bangor & Piscataquis	M. H. Angel	L. H Eaton	Bangor, Maine.
Boston, Barre & Gardner	I. N. Ross		Worcester, Mass.
Boston & Albany	*Wm. Bliss		Boston, Mass
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & Providence	A. A. Folsom	A. A. Folsom	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood		Fitchburg, Mass.
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A Dodge	Lyon & Vose	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood	Boston, Mass.
Boston, Lowell & Nashua	W. M. Parker.		Boston, Mass.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Brunswick & Albany	C. L. Schlatter		Brunswick, Ga.
Burlington & Missouri River (in Neb.)	Wm. Irwin.		Plattsmouth, Neb.
Burlington, Cedar Rapids & Minnesota	W W. Walker	S. L. Dows	Cedar Rapids, Ia.
Burlington & South-Western	R. T. Hosford		Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. H. Potter	N. M. Whitside	Corry, Pa.

C

Cairo & St. Louis	J. L. Hinkley	C. Ritsema	St. Louis, Mo.
Cairo & Vincennes	Henry L. Morrill		Cairo, Ill.
Camden & Atlantic	§F. A. Lister	J. L. Wendell	Camden, N. J.
Canada Central, Brockville, & Ottawa	H. P. Alden		Brockville, Can.
Canada Southern	*L. D Rucker		Toledo, Ohio.
Canada Southern		E. W. Porter	St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua, Pa.
Cayuga Lake	J. L. Grant		Ithaca, N. Y.
Central Branch Union Pacific	W. F. Downs	W. F. Downs	Atchison, Kan.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Central Pacific	‡John Corning		Sacramento, Cal.
Western Division	E. C. Fellows		Lathrop, Cal.
Visalia Division	E. C. Fellows		Lathrop, Cal.
Truckee Division	Frank Free		Wadsworth, Nev.
Humboldt Division	R. S. Matteson		Carlin, Nevada.
Oregon Divison	J. A. Fillmore		Sacramento, Cal.
Sacramento Division	J. A. Fillmore		Sacramento, Cal.
Salt Lake Division	R. H. Pratt		Ogden, Utah.
California Pacific Division	A. D. Wilder		Vallejo, Cal.
Central Vermont	J. W. Hobart		St. Albans, Vt.
Western Division	John Schrier		Ogdensburg, N. Y.
Central & Southern Division	Ambrose Arnold		St. Albans, Vt.
Northern & Eastern Division	G. L. Stone	" "	"
Rutland Division	J. Burdett		Rutland, Vt.
Harlem Extension Division	J. Burdett		Rutland, Vt.
New-London Northern	G. W. Bentley		New-London, Ct.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	Thos. Dodamead	J. A. Netherland	Richmond, Va.
Middle Division	H. D. Chapin		Staunton, Va.
Charlotte, Columbia & Augusta	James Anderson		Columbia, S. C.
Cheshire	R. Stewart	H. H. Stone	Keene, N. H.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt	R. W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	J. B. Mulliken		Escanaba, Mich.
Madison Division	C. A. Swineford.		Baraboo, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver		Clinton, Iowa.
Western Iowa Division	John A. Head		Boone, Iowa.
Chicago & Alton	J. C. McMullen	A. V. Hartwell	Chicago, Ill.
Chicago, Burlington & Quincy	R. Harris	D. B. Sibley	Chicago, Ill.
Chicago Burlington & Quincy	‡C. H. Hudson		Chicago, Ill.
Eastern and Middle Division			Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota	C. Harris	F. I. Massey	Dubuque, Iowa.
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	*Geo. S. Bowen	James Penny	Chicago, Ill.
Chicago & Pacific	J. M. Whitman		Chicago, Ill.
Chicago & Paducah			Streator, Ill.
Chicago, Rock Island & Pacific	Hugh Riddle	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chicago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.
Chicago & Michigan Lake Shore	*Geo. C. Kimball	Wm. R. Morrison	St. Joseph, Mich.
Chicago, Danville & Vincennes	L. Pearson	C. B. Mansfield	Chicago, Ill.
Chicago, Milwaukee & St. Paul	*S. S. Merrill	J. J. Slocum	Milwaukee, Wis.
Chicago, Pekin & Southwestern	W. P. Sisson		Streator, Ill.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Chicago & Canada Southern	D. Edwards		Toledo, Ohio.
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.
Cincinnati & Muskingum Valley	C. C. Wait		Zanesville, O.
Cincinnati, Richmond & Chicago	Lewis Williams		Cincinnati, Ohio
Cincinnati & Martinsville	T. C. Burnside		Franklin, Ind.
Cincinnati & Terre Haute			Terre Haute, Ind.
Cin., Cumberland Gap & Charleston	W. J. Taylor		Knoxville, Tenn.
Cincinnati Hamilton & Dayton	Lewis Williams	P. Hickey	Cincinnati, Ohio.
Cincinnati, Hamilton & Indianapolis	Lewis Williams		Cincinnati, Ohio.
Cincinnati, Lafayette & Chicago	E. H. Waldron	G. G. Hadley	Lafayette, Ind.
Cincinnati, Sandusky & Cleveland	*D. W. C. Brown		Sandusky, Ohio.
Cleveland, Columbus, Cincinnati & Ind	E. S Flint		Cleveland, Ohio.
Indianapolis Division	C. C. Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Cleveland, Mt. Vernon & Delaware	G. A. Jones		Mt. Vernon, Ohio.
Cleveland, Tuscarawas Val. & Wheeling	*E. B. Thomas	W. W. Card, *Supt.*	Cleveland, Ohio.
Colorado Central	P. J. Nichols		Golden, Col.
Columbus & Hocking Valley	M. M Green		Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H. E. Chamberlin	H. E. Chamberlin	Concord, N. H.
Connecticut River	John Mulligan	John Mulligan.	Springfield, Mass.
Connecticut & Passumpsic Rivers	Geo. A. Merrill	Geo. Killey	Lyndonville, Vt.
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Corning, Cowanesque & Antrim	A. H. Gorton	R. J. Burnham	Corning, N. Y.
Cumberland Valley	I. F. Boyd	I. F. Boyd	Chambersburg, Pa.
Cumberland & Pennsylvania	J. A. Millholland		Mt. Savage, Md.

D

Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	J. R. Meckling	J. R. Meckling	Sioux City, Iowa
Davenport & St. Paul	N. H. Wood		Davenport, Iowa.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware & Hudson Canal Co	*C. F. Young		Honesdale, Pa.
Albany & Susq. Division	H. S. Morse		Oneonta, N. Y.
Rensselaer & Saratoga Div	Theo. Voorhees		Troy, N. Y.
Delaware, Lackawanna & Western	G. W. B. Cushing		New-York City.
Delaware, Lackawanna & Western	W. F. Hallstead.		Scranton, Pa.
Morris & Essex Division	Andrew Reasmer		Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus. Division	W. F. Hallstead		Utica, N. Y.
Denver & Rio Grande	W. W. Borst	W. S. Jackson	Denver, Col.
Detroit and Milwaukee	W. K. Muir	John S. Lorimer.	" "
Detroit, Hillsdale & Indiana	W. F. Parker.		Ypsilanti, Mich.
Detroit, Eel River & Illinois	A. B. Southard		Denver, Ind.
Detroit, Lansing & Lake Michigan	A. H. Reese	C. D. Childs	Detroit, Mich
Dorchester & Delaware	J. M. Murphy		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer	C. V DeForest	Dunkirk, N. Y.
Dubuque & South-Western	J. P. Farley		Dubuque, Iowa

E

East Alabama & Cincinnati	B. Boyle		Opelika, Ala.
East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern & Maine Central	Geo. Bachelder		Boston, Mass.
Eastern & Maine Central	*C. F. Hatch	C. W. Pratt	Boston, Mass.
Erie & Pittsburg	J. M. Kimball		Erie, Pa
Erie Railway,	E. S. Bowen	C. H. Bowman	New-York City.
Erie	P. P. Wright		Jersey City, N. J.
Eastern Division	E. O. Hill		Port Jervis, N. Y.
Delaware Division	Benj. Thomas		Port Jervis, N. Y.
Rochester Division	M. E. Brown		Rochester, N. Y.
Susquehanna Div.	C. W. Gardner		Elmira, N. Y.
Buffalo Division	R. G. Taylor		Buffalo, N. Y.
Western Division	J. S. Beggs		Buffalo, N. Y.
Erie & Pittsburg		Wm. Mullins	Pittsburg, Pa.
European & North-American	M. H. Angel	M. H. Angell	Bangor, Maine.
Evansville & Crawfordsville	John E. Martin		Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.

F

Fitchburg	Chas. L. Heywood	John Adams	Boston, Mass.
Flint & Pere Marquette	Sanford Keeler	Geo. C. Cook	East-Saginaw, Mich.
Flushing & North-Shore	I. D. Barton		Hunter's Point, L. I.
Flushing & North-Shore		A. E. Godeffroy	New-York City.
Fort Wayne, Jackson & Saginaw	P. B. Loomis		Jackson, Mich.
Fort Wayne, Muncie & Cin	W. W. Worthington		Fort Wayne, Ind.

G

Galveston, Harrisburg & San Antonio	Hardy Eddins	J. W. Pierce.	Galveston, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Georgia	S. K. Johnson	John Vaughn	Augusta, Ga.
Gilman, Clinton & Springfield	D. H. Conklin		Springfield, Ill.
Grand Rapids & Indiana	*C. E. Gorham		Fort Wayne, Ind.
S. Division	J. M. Matheany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich.
Grand Rapids & Indiana	*W. O. Hughart	William Mullins	Pittsburg, Pa.
Grand Trunk	*J. Hickson	John Taylor	Montreal, Canada.
East Division	Henry Bailey		Montreal, Canada.
West Division	W. J. Spicer		Toronto, Canada.
Grand Tower and Carbondale		Wm. W. Harris	Grand Tower, Ill.
Great Southern of Ga. & Fla	M. H. Alberger		Jacksonville, Fla.
Great Western (Canada)	Andrew Watson	Robert Beatty	Hamilton, Canada.
Green Bay & Minnesota	S. B. Kenrick		Green Bay, Wis.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.

H

Hannibal & St. Joseph	H. H. Courtright.	L. W. Towne. / W. J. Hilton. / L. W. Morse.	Hannibal, Mo.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin	D. S. Draper	Bridgeport, Ct.
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	C. A. Burton		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top.	Geo. F. Gage	B. A. Knight	Huntingdon, Pa.

I

Illinois Central	Jos. F. Tucker		Chicago, Ill.
Illinois Central.	*Jas. C. Clarke	O. Ott	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois Midland.	D. Hitchcock .	‡P. Campbell	Terre Haute, Ind.
Illinois & St. Louis	W. K. McComas		St. Louis, Mo.
Indianapolis, Bloomington & Western	J. E. Gimperling		Indianapolis, Ind.
Indianapolis, Bloomington & Western	Geo. B. Wright, Receiver		Indianapolis, Ind.
Indianapolis, Cincinnati & Lafayette	Geo. L. Barringer	E. V. Cherry	Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna		Indianapolis, Ind.
Indianapolis & Vincennes		Wm. Mullins.	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward	J. W. Morse.	St. Louis, Mo.
Indianapolis, Peru & Chicago	C. B. Robinson	D. Macy.	Indianapolis, Ind.
Michigan City Division	E. C. Murphy		La Porte, Ind.
Intercolonial Railway	Lewis Carvell	Sam. Watson	Moncton, N. B.
International & Great Northern	H. M. Hoxie		Houston, Texas.

J

Jacksonville, North-Western & S. E.	E. S. Greenleaf		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	Robert Walker		Jacksonville, Ill.
Jeffersonville, Madison & Indianapolis		Wm. Mullins	Pittsburg, Pa.
Jefferson, Madison & Indianapolis,	Horace Scott		Louisville, Ky.
Junction & Breakwater	Wm. Groom		Lewis, Del.

K

Kansas Central	W. R. Martin		Leavenworth, Kan.
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard	J. F. Barnard	St. Joseph, Mo.
Kansas City, St. Joseph & Council Bluffs	*Geo. H. Nettleton		Kansas City, Mo.
Kansas Midland	W. W. Fagan.		Topeka, Kan.

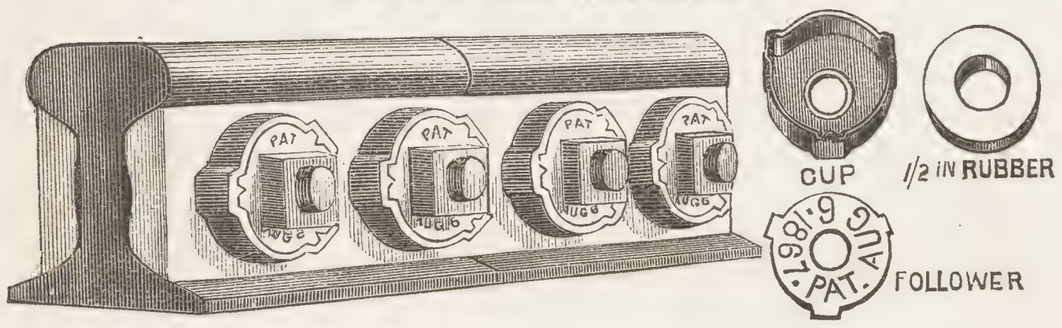
Railroad.	Superintendent.	Purchasing Agent.	Residence.
Kansas Pacific	O. S. Lyford		Kansas City, Mo.
Kansas Pacific	O. S. Lyford	J. L. Woods	St. Louis, Mo.
Kaw Valley Division	O. H. Dorrance		Lawrence, Kan.
Smoky Hill Division	A. B. Garner		Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col
Kentucky Central	G. H. Pendleton.	Geo. P. Bowler	Covington, Ky.
Keokuk & Des Moines Valley	Geo. H. Griggs	G. E. Kilbourne	Keokuk, Iowa.
Knox & Lincoln	C. A. Coombs	Oliver Morse	Bath, Maine.
L			
Lackawanna & Bloomsburg	D. T. Bound		Kingston, Pa.
Lackawanna & Bloomsburg		G.W. B. Cushing.	New-York City.
Lake Erie & Louisville	I. H. Burgoon.		Fremont, Ohio.
Lake Ontario Shore	George Bennett		Oswego, N. Y.
Lake Superior & Mississippi	G. H. Smith	C. F. Cruft	St. Paul, Minn.
Lake Shore & Michigan Southern	Charles Paine	A. C. Armstrong.	Cleveland, Ohio.
Kalamazoo Division	William Wheaton		Kalamazoo, Mich.
Detroit Division			
Lansing Division			
Leavenworth, Lawrence & Galveston	B. S. Henning	Allan Bourne	Lawrence, Kan.
Leavenworth, Lawrence & Galveston	*Geo. H. Nettleton		Kansas City, Mo.
Lawrence & South-Western	R. B. Gemmell	R. B. Gemmell	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
	L. Chamberlin		Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa.
Mahony Division	James I. Blakslee		Mauch Chunk, Pa.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	T. Hartman		Little Rock, Ark.
Logansport, Crawfordsville & S. W.			Terre Haute, Ind.
Long Island	G. W. N. Custis.	Oliver Charlick.	Hunter's Point, L. I.
Louisville & Nashville & G. Southern	Albert Fink	G. C. Breed	Louisville, Ky.
Clarksville Division	Jas. Montgomery		Bowling Green, Ky.
Memphis Division	J. T. Flynn		Memphis, Tenn.
Nashville & Decatur Division	D. F. Whitcomb		Nashville, Tenn.
So. & North Ala. Division	Robert Meek		Birmingham, Ala.
Louisville, Cin. & Lexington	J. McLeod	Wm. Mahl	Louisville, Ky.
Louisville, New-Albany & Chicago	John L. Day	J. R. Parker	New-Albany, Ind.
Louisville, Paducah & Southwestern	D. F. Whitcomb.	D. F. Whitcomb	Louisville, Ky.
M			
Macon & Brunswick	J. W. Gun		Macon, Ga.
Macon & Western	Capt. G. I. Foreacre		Atlanta, Ga.
Maine Central	*Chas. F. Hatch		Boston, Mass.
Maine Central	Payson Tucker		Augusta, Me.
Androscoggin Division	A. Brown.		Lewiston, Me.
Manchester & Lawrence	H. E. Chamberlin		Concord, N. H.
Marietta & Cincinnati	W. W. Peabody.	S. L. Campbell	Cincinnati, Ohio.
Marietta, Pittsburg & Cleveland	Jas. McArthur.	R. B. Hoover	Marietta, Ohio.
Marquette, Houghton & Ontonagon	*Samuel Schoch.	S. Schoch	Marquette, Mich.
Maryland & Delaware	J. L. Caldwell.	J. L. Caldwell.	Easton, Md.
Memphis, Carthage & North-Western	E. H. Brown		Carthage, Mo.
Memphis & Little Rock	T. S. Tate, Jr.	J. D. Darden	Memphis, Tenn.
Memphis & Charleston	W. J. Ross	J. B. Gallaway	Memphis, Tenn.
Michigan Central	W. B. Strong		Chicago. Ill.
Michigan Central	‡J. R. Ledyard	John Newell	Detroit, Mich.
Grand River Valley Division	C. B. Bush		Grand Rapids, Mich.
Air-Line, So. Bend & Joliet	E. C. Brown		Jackson, Mich.
Bay City Division	T. B. Sargent	D. A. Waterman	Detroit, Mich.
Jackson. Lansing & Saginaw Div.	C. B. Bush		Saginaw City, Mich.
Michigan Lake Shore	Chas. E. Gorham		Fort Wayne, Ind.
Michigan Lake Shore	P. S. O'Rourke		Monteith, Mich.
Midland Railway of Canada	H. G. Taylor		Port Hope, Ont.
Midland Pacific	J. N. Converse	M. A. Showers.	Nebraska City, Neb.
Milwaukee, Lake Shore & Western	H. G. H. Reed		Milwaukee, Wis.
Western Division	J. S. Buck.		Appleton, Wis.
Mineral Point	G. W. Cobb.	G. W. Cobb	Mineral Point, Wis.
Mineral Range	J. H. Macdonald		Hancock, Mich
Mississippi & Tennessee	M. Burke	M. Burke	Memphis, Tenn.
Mississippi Valley & Western	Guy Wells.		Quincy, Ill.
Missouri, Iowa & Nebraska	Col. Henry Hill		Warsaw, Ill.
Missouri, Kansas & Texas	C. H. Chappel		Sedalia, Mo.
Missouri, Kansas & Texas.		G. M. Babcock.	Sedalia, Mo.
Cherokee Division	L. H. Sheldon		Parsons, Kansas.
Choctaw Division	S. G. Eddy		Dennison, Texss.
Missouri Division	J. J. Frey		Sedalia, Mo.
Sedalia Division	J. J. Frey		Sedalia, Mo.
Neosho Division	L. H. Sheldon		Parsons, Kansas.
Osage Divsion	C. M. Sheafe		Holden, Mo.
Missouri Pacific	A. A. Talmage	W. H. Patriarche.	St. Louis, Mo.
Missouri River, Fort Scott & Gulf	B. S. Henning	Allan Bourn	Kansas City, Mo.
Missouri River, Fort Scott & Gulf	*Geo. H. Nettleton		Kansas City, Mo.
Mobile & Ohio	A. L. Rives.	C. E. Rushing	Mobile, Ala.
Alabama Division	Cecil Fleming		Mobile, Ala.
Mississippi Division	E. S. Hosford		Macon, Miss.
Tenn. & Ky. Divis on	G. W. Robertson		Jackson, Tenn.
Mobile & Girard	W. L. Clark		Columbus, Ga.
Mobile & Montgomery	G. Jordon.	G. Jordon	Montgomery, Ala.
Montgomery & Eufaula	B. Dunham	B. Dunham	Montgomery, Ala.
Morgan's Louisiana & Texas		C. A. Whitney & Co.	New-Orleans, La.
N			
Nashville, Chattanooga & St. Louis	J. W. Thomas	L. P. Barnes	Nashville, Tenn.
Naugatuck	G. W. Beach		Bridgeport, Ct.
New-Brunswick & Canada		Tho. H. Street	St. Andrews, N. B.
New-Brunswick & Canada	John Stewart		St. Stephens, N. B.
New-Bedford & Taunton	Warren Ladd		New-Bedford, Mass.
New-Haven & Derby	E. S. Quintard		New-Haven, Ct.
New-Haven & Northampton	C. N. Yeamans	C. N. Yeamans.	New-Haven, Ct.
New-Haven, Middletown & Willimantic	W. A. Waterbury.	W.A. Waterbury	Middletown, Ct
New-Jersey & New-York	W. D. Beasley		Jersey City, N. J.
New-Jersey Midland	W. E. Lewis		Wortendyke, N. J.
New-Jersey Southern	*W. S. Sneden		Long Branch, N. J
New-Orleans & Selma	T. H. Du Puy		Selma, Ala.
New-Orleans, St. Louis & Chicago	*E. D. Frost	S. H. Edgar, V. P.	New-Orleans, La.
New-Orleans & Mobile	D. B. Robinson		Mobile, Ala.
New-York & Harlem	Chas. M. Bissell.	R. C. Moore	New-York, N. Y.
New-York, New-Haven & Hartford	E. M. Reed	R. N. Dowd	New Haven, Ct.
N. Y. & N. H. Division	John T. Moody		New-York, N. Y.
Hartford Division	C. S. Davidson		Hartford, Ct.
Shore Line Division	W. H. Stephenson		New-Haven, Ct.
New-York, Boston & Montreal	C. L. Kimball		Dutchess Jn., N. Y.
New-York Central & Hudson River	J. Tillinghast		Albany, N. Y.
New-York Central & Hudson River		C. V. DeForest.	New-York.
Eastern Division	Zenas C. Priest		Utica, N. Y.
Syracuse & Rochester Division	G. H. Burrows		Syracuse, N. Y.
Buffalo & Rochester Division	M. W. Torrence		Buffalo, N. Y.
New-York & New-England	H. A. G. Pomeroy		Boston, Mass.
Worcester Division	P. St. M. Andrews		Worcester, Mass.
New-York & Oswego Midland.			New-York, N. Y.
New-Jersey Division	G. W. N. Custis		Jersey City, N. J.
Middle Division	H. M. Flint		Middletown, N. Y.
Western Division			Oswego, N. Y.
New-York, Kingston & Syracuse	H. P. Breed		Rondout, N. Y.
New-York, Providence & Boston	A. S. Matthews.	A. S. Matthews	Stonington, Ct.
New Brunswick	Tho. Hoben	W. R. Logan	Fredericton, N.B.
Northern Pacific	*C. W. Mead.	E. F. Williams	St. Paul, Minn.
Minnesota Division	J. H. Sullivan		Brainerd, Minn.
Northern Pacific Division	*J. W. Sprague		Kalama, W. T.
Lake Superior & Miss. Division.	George H. Smith		St. Paul, Minn.
North-Louisiana & Texas	W. R. Gordon.		Monroe, La.
North-Pennsylvania	S. W. Roberts.	F. A. Cornby	Philadelphia, Pa.
Northern Canada	†F. W. Cumberland		Toronto, Can.
Northern Central		Godfrey W. Rhodes.	Baltimore, Md.
Northern Central	*Frank Thomson		Philadelphia, Pa.
Northern (New-Hampshire)	George E. Todd		Concord, N. H.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
North-Eastern (South-Carolina)	F. K. Huger		Charleston, S. C.
O			
Ohio & Mississippi	E. L. Ryder		Cincinnati, Ohio.
Oil Creek & Alleghany River	C. J. Hepburn		Oil City, Pa.
Old Colony	J. R. Kendrick		Boston, Mass.
Omaha & North-Western	J. E. House		Omaha, Neb.
Oregon & California	J. Brandt, Jr.		Portland, Oregon.
P			
Paducah & Memphis	M. Burke		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Paris & Danville	B. F. Matthius		Danville, Ill.
Pennsylvania	G. Clinton Gardner		Altoona, Pa.
Pennsylvania	*Frank Thomson	Enoch Lewis	Philadelphia, Pa.
Philadelphia Division	W. F. Lockard		Philadelphia, Pa.
Middle Division	J. N. McCrea		Harrisburg, Pa.
Pittsburg Division	Rob't Pitcairn		Pittsburg, Pa.
Tyrone Division	S. S. Blair		Tyrone Pa.
Bedford Division	S. M. Prevost		Bedford, Pa.
West Pennsylvania Division	J. McC. Creighton		Allegheny City, Pa.
Pennsylvania & New-York Canal	A. Mitchell		Wilkesbarre, Pa.
Pensacola & Louisville	C. S. Williams		Pensacola, Fla.
Peoria & Rock Island	John R. Hilliard		Peoria, Ill.
Peoria & Rock Island	*W. R. Hamilton.	W. R. Hamilton	Peoria, Ill.
Peoria, Pekin & Jacksonville	James F. Kelsey.	John Allen	Pekin, Ill.
Petersburg	R. A. Bacon	W. P. Taylor	Petersburg, Va.
Philadelphia & Reading	J. E. Wootten	W. S. Wilson	Reading, Pa.
Catawissa & Williamsport Br'ch.	George Webb		Pittsburg, Pa.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Lebanon & Tremont	H. W. Tracy		Pine Grove, Pa.
Philadelphia and Baltimore Central	Henry Wood	Henry Wood	Philadelphia, Pa.
Philadelphia & Erie	W. A. Baldwin.		Williamsport, Pa.
Philadelphia & Erie		Enoch Lewis.	Philadelphia, Pa.
Western Division	J. W. Reynolds		Erie, Pa.
Middle Division	Edmund L. Tyler		Renovo, Pa.
Eastern Division	Thomas Gucker		Williamsport, Pa.
Philadelphia, Wilmington & Baltimore	H. F. Kenney		Philadelphia, Pa.
Pithole Valley	J. T. Odell		Pithole City, Pa.
Pittsburg, Cincinnati & St. Louis	S. M. Felton, Jr.	Wm. Mullins.	Pittsburg, Pa.
Pittsburg & Cin. Division	S. M. Felton, Jr		Pittsburg, Pa.
Little Miami Division	J. D. Ellison.		Cincinnati, Ohio.
Indianapolis & C. Division.	D. W. Caldwell		Columbus, Ohio.
Pittsburg, Washington & Baltimore	E. K. Hindman		Connellsville, Pa.
Pittsburg, Ft. Wayne & Chicago	*J. N. McCullough.	Wm. Mullins.	Pittsburg, Pa.
Eastern Division	George Webb		Pittsburg, Pa.
Western Division	C. D. Gorham		Fort Wayne, Ind.
Port Royal	R. G. Fleming.		Augusta, Ga.
Portland & Ogdensburg	J. Hamilton	John E. Donnell	Portland, Maine.
Portland & Rochester	W. H. Turner	W. H. Turner	Portland, Maine.
Portland, Saco & Portsmouth	Francis Chase.		Portland, Maine.
Portsmouth, Great Falls & Conway	J. W. Sanborn		Portsmouth, N. H.
Portsmouth	H. E. Chamberliu		Concord, N. H.
Poughkeepsie & Eastern	J. A. Perkins	A. W. Cable	Poughkeepsie, N. Y
Providence & Worcester	W. D. Hilton	W. D. Hilton	Providence, R. I.
Providence, Warren & B	Waterman Stone		Providence, R. I.
Q			
Quincy, Alton & St. Louis	N. J. T. Dana	N. J. T. Dana	Quincy, Ill.
Quincy, Missouri & Pacific	J. R. Buchanan		Quincy, Ill.
R			
Raleigh & Gaston	A. B. Andrews	A. B. Andrews	Raleigh, N. C.
Richmond, York River & Chesapeake	E. F. Folger	Hugh Graham	Richmond, Va.
Richmond & Danville	T. M. R. Talcott		Richmond, Va.
Richmond, Fred. & Potomac	E. T. D. Myers.	T. L. Courtney	Richmond, Va.
Richmond & Petersburg	Augustus Shaw.		Richmond, Va.
Rockford, Rock Island & St. Louis	W. H. Ferry, Receiver		RockIsland, Ill.
Northern Division	Henry Looseley		Rock Island, Ill.
Southern Division	Geo. L. Walker		Beardstown, Ill.
Rome, Watertown & Ogdensburg	J. W. Moak		Watertown, N. Y.
S			
St. Lawrence & Ottawa	R. Luttreil		Prescott, Can.
St. Joseph & Denver City	*L. D. Tuthill		St. Joseph, Mo.
St. Paul & Pacific	E. Q. Sewell	E. C. Becker	St. Paul, Minn.
St. Paul & Sioux City	J. F. Lincoln	J. F. Lincoln	St. Paul, Minn.
St. Louis, Alton & Terre Haute.	W. G. Broughton		St Louis, Mo.
St. Louis, Iron Mountain & Southern	Arthur W. Soper.	W. S. Cuddy	St. Louis, Mo.
St. Louis, Iron Mountain & Southern	*Tho. McKissock		St. Louis, Mo.
St. Louis & South-Eastern	*E. F. Winslow	A. G. Thompson.	St. Louis, Mo.
St. Louis Division	George S. Winslow		Mt. Vernon, Ill.
Nashville Division	R. H. G. Minty		Nashville, Tenn.
St. Louis, Kansas City & Northern	W. R. Arthur	R. W. Green	St. Louis, Mo.
St Louis Division	W. H. Vaughan		St. Louis, Mo.
Western Division	C. L. Dunham		Kansas City, Mo.
St. Louis, Vandalia, Terre Haute & Ind.	John E. Simpson.		Indianapolis, Ind.
St. Louis, Vandalia, Terre Haute & Ind.	Chas. R. Peddle		Terre Haute, Ind.
St. Louis, Lawrence & Western	E. C. Devereaux		Lawrence, Kan.
St. Louis, Salem & Little Rock	J. W. Blanchard.	H. A. Crawford.	St. Louis, Mo.
Sacramento Valley & P. & S. V	F. A. Bishop		Sacramento, Cal.
Saginaw Valley & St. Louis	N. M. Merrill.	N. M. Merrill.	Saginaw, Mich.
San Francisco & Northern Pacific	A. A. Bean	F. H. Gudes	Petaluma Cal.
San Rafael & San Quentin.	David Nye		San Rafael, Cal.
Savannah & Charleston	C. S. Gadsden		Charleston, S. C.
Seaboard & Roanoke		E. G. Ghio	Baltimore, Md.
Selma, Marion & Memphis	E. W. Rucker	E. W. Rucker	Marion, Ala.
Selma, Rome & Dalton	M. Stanton		Selma, Ala.
Sheboygan & Fond du Lac	L. A. Emerson	L. A. Emerson	Fond du Lac. Wis.
Shenango & Allegheny	I. T. Blair		Greenville, Pa.
Sioux City & Pacific	L. Burnett	L. Burnett	Missouri Valley, Ia.
Sodus Point & Southern	H. Van Vleck		Sodus Point, N. Y.
South-Shore	J. R. Kendrick.		Boston, Mass.
South Carolina	S. S. Solomon	A. Mitchell	Charleston, S. C.
Southern Central	Jas. G. Knapp		Auburn, N. Y.
Southern, of Long Island	I. D. Barton		Hunter's Point, L.I.
Southern, of Long Island		A. E. Godeffroy	New-York City.
Southern Minnesota	W. C. Van Horne.		Wells, Minn.
Southern Pacific of California	A. N. Towne		Sacramento, Cal.
Southwestern of Georgia	Virgil Powers		Macon, Ga.
Spartanburg & Union	W. W. Davies		Spartanburg, S. C.
Springfield Athol & Northeastern	John W. Phelps		Springfield, Mass.
Springfield & North-Western	*A. J. Ware		Pekin, Ill.
Staten Island	J. W. Wilbur		New-York, N. Y.
Stockton & Ione	W. G. Miller		Stockton, Cal.
Stonington & Providence	A. S. Mathews	A. S. Mathews	Stonington, Ct.
Sullivan & Erie	Wm. Stevenson		Towanda, Pa.
Summit County	W. M. Riter		Coalville, Utah.
Syracuse Northern	J. W. Moak		Watertown, N. Y.
Syracuse, Binghamton & New-York	T. Voorhees	G. W. B. Cushing.	Syracuse, N. Y.
T			
Tennessee & Pacific	George Maney		Nashville, Tenn.
Terre Haute & Indianapolis	J. E. Simpson		Indianapolis, Ind.
Terre Haute & Indianapolis		C. R. Peddle	Terre Haute, Ind.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	Geo. H. Noble		Marshall, Texas.
Tioga	L. H. Shattuck		Blossburg, Pa.
Toledo, Peoria and Warsaw	A. L. Hopkins, *Receiver*		Peoria, Ill.
Toledo, Peoria & Warsaw		Oran Ott	Chicago, Ill.
Western Division	David K. Smith		Peoria, Ill.
Western Division	William E. Dorwin		Warsaw, Ill.
Toledo, Wabash & Western	Robert Andrews.	J. T. Sterling	Toledo, Ohio.
Eastern Division	K. H. Wade		Lafayette, Ind.
Western Division	C. W. Bradley		Springfield, Ill.
Toledo, Canada Southern & Detroit	D. Edwards		Toledo, Ohio.
Troy & Boston	C. W. Moseley		Troy, N. Y.
Toronto, Grey & Bruce	N. Weatherston	W. Watson	Toronto, Can.

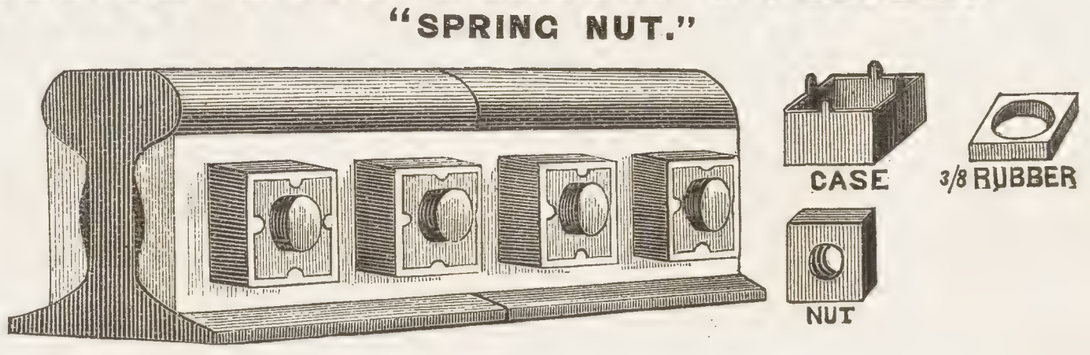
Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Toronto & Nipissing	J. C. Bailey		Toronto.
Tuckerton	J. Naramore		Tuckerton, N. J.
U			
Union Pacific	S. H. H. Clarke	S. H. H. Clarke	Omaha, Neb.
Mountain Division	S. J. Nichols		Cheyenne, Wyom'g.
Laramie Division	S. T. Shankland		Laramie, Wyoming.
Western Division	O. H. Earll		Evanston, Wyoming.
Utah Central & Southern	John Sharp	S. H. Hill	Salt Lake City
Utica & Black River	J. F. Maynard		Utica, N. Y.
Utica, Ithaca, & Elmira	H. P. Goodrich		Ithaca, N. Y.
V			
Vermont & Mass. & Troy & G	O. T. Ruggles	O. T. Ruggles	Fitchburg, Mass.
Vicksburg & Meridian	E. F. Raworth		Vicksburg, Miss.
Virginia & Truckee	H. M. Yerington	C. P. Mason	Carson, Nevada.
W			
Washington & Ohio	R. H. Havener	Lewis McKenzie	Alexandria, Va.
Welland	William Pay		St. Catherine, Ont.
Westchester & Philadelphia	Henry K. Smith	J. J. Bryant	Philadelphia, Pa.
West-Wisconsin	W. G. Swan		Hudson, Wis.
West-Jersey	W. J. Sewell	Enoch Lewis	Camden, N. J.
Western of North-Carolina	John M. Rose		Fayetteville, N. C.
Western & Atlantic	Wm. McRae		Atlanta, Ga.
Western Maryland	*J. M. Hood		Baltimore, Md.
Western Union	D. A. Olin		Racine. Wis.
Wilmington & Western	David Connell		Wilmington, Del.
Wilmington, Columbia & Augusta	James Anderson	James Anderson	Wilmington, N. C.
Wilmington & Weldon	J. F. Devine		Atlanta, Ga.
Wilmington & Reading	E. Collings	C. Stoltz	Coatesville, Pa.
Winona & St. Peter	S. Sanborn		Madison, Wis.
Winona & St. Peter		R. W. Hamer	Chicago, Ill.
Wisconsin Central	E. B. Phillips		Milwaukee, Wis.
Worcester & Nashua	C. S. Turner	C. S. Turner	Worcester, Mass.

PRATT'S PATENT COMPENSATING FISH-PLATE JOINTS.

"SPRING CUP-WASHER."



"SPRING NUT."



Track Bolts and Nuts are constantly subjected to a vibration and jar. One large item of expense is for wrench-work and replacement of bolts and nuts already off.

Most of the contrivances for removing this trouble are failures. They do not remove the cause of the trouble. This can only be done by some elastic material, which will absorb the vibration and prevent its reaching the nuts. Experience proves that permanent elasticity can not be obtained by using wood, which is perishable, or steel, which can not be made of uniform temper. In our inventions, the elastic packing of rubber between the nut and the plate absorbs the jar or vibration, insulates the nut, and by removing the cause of the trouble removes the trouble itself. Among its advantages are these:

1st. It saves the expense of wrench-work and loss of nuts.

2d. The rubber absorbs the blow given by the wheels at the joint, in such manner as to prevent fracture of rails at the joint, and accidents resulting therefrom.

3d. The track is made noiseless.

4th. Rails are saved from pounding out at the ends, and the thread of the bolts and nuts from stripping.

The practical value of these inventions is more fully demonstrated by the two million joints now long in use.

Manufactured and Sold by

THE PRATT MANUFACTURING COMPANY,

NO. 71 BROADWAY, NEW-YORK,

Manufacturers and Dealers in all kinds of RAILWAY TRACK SUPPLIES; also, New-York Agents for the Tuttle & Whittemore Co., Naugatuck Conn., Manufacturers of REFINED MALLEABLE IRON CASTINGS, from Patterns to order.

Special attention given to MALLEABLE IRON CASTINGS for Railroad Car construction.

JOS. W. SPRAGUE, Pres't and Sup't. **W. CRICHTON, Jr., Sec'y and Treas.**



MANUFACTURERS OF

PASSENGER AND FREIGHT CARS.

Car Wheels and Car Castings and Forgings.

VOSE, DINSMORE & CO.,

Importers, Manufacturers, and Dealers in

Railway and Steamship

SUPPLIES

Of all Kinds.

JOHN C. WYMAN, General Manager.

194 Lake Street, Chicago.

720 North Second Street, St. Louis.

32 Warren St.,

NEW-YORK.

NOYES' PATENT LIQUID PACKING.

For Cooling Railroad Car and Steamboat Journals, and Bearings of all kinds, and for Mixing with other Oils.



The attention of those who are running heavy journals is respectfully invited to the above Liquid Cooler. It has been successfully used for upward of two years, and is constantly growing in favor, as its merits become known, and we are confident that practical men can not fail of being convinced that our preparation deserves their candid attention. What we claim for it is :

That it will Cool a Hot Journal when in Motion,

and extinguish the flame when the box is on fire; that its use will, in a great measure, prevent the occurrence of a hot journal, and save the expense, delays, and annoyances incident thereto; that it will eliminate the heat from a journal at a temperature greatly below the point required to melt the babbitt, preventing an accumulation of heat, and by a timely application save it from destruction; that its non-inflammable elements (where waste is used) permeate the waste and prevent its taking fire; that it keeps the journal smooth and polished, preventing unnecessary friction; that its combination is based upon true scientific principles, which renders it impossible to fail in its results, and is

The only Preparation that will Cool a Hot Journal

while it is in motion, as attested by certificates below; that one thorough application on a hot journal will do more execution in cooling than the constant application of water for half an hour, besides doing it evenly and without loss of time.

Every Railroad or Steamboat

should have a can of the Liquid Packing on board, with the directions for its use pasted upon it, and thus always have at hand the means of effectually cooling a hot journal, and thereby avoid the expense, danger, and trouble from this cause.

FOR RAILROADS, AN EXCELLENT AND DURABLE LUBRICATOR

can also be made by combining with the Liquid Packing certain quantities of mineral oil, according to the season of the year in which it is to be used, as set forth in the directions. The combination produces a soft, heavy body, that is very essential in hot weather—an element that is lacking in mineral oil. The Liquid also keeps oil sweet, by preventing oxidation, and its value is greatly enhanced by the additional body which it acquires; and, considering the increased durability, it will be found a matter of considerable economy to combine the Liquid and mineral oil together. In cold weather, the combination is not so essential, but it will always be found economical to combine a small quantity of the Liquid with the mineral oil which is generally used upon railroads.

Where Black oil is used as a lubricator exclusively, mixed as directed, especially in warm weather, it will be found a great improvement, and fully equal to lard oil, making a considerable percentage of saving in cost, lessening the liability of hot boxes; and animal oil can be entirely discarded, even in warm weather, and as good results obtained, with less expense, as where all animal oil is used. We manufacture suitable cans for using the LIQUID PACKING. Send for circulars containing full description and instruction for use.

WHAT RAILROAD MEN SAY OF IT.

BOSTON, LOWELL AND NASHUA R.R. SUPERINTENDENT'S OFFICE,
P. NOYES, AGENT: BOSTON, April 13, 1874.

Dear Sir: We have been using your LIQUID PACKING, and consider it one of the best articles for cooling off hot boxes that we have ever been acquainted with. All of our trains are supplied with a can of it. JOHN B. WINSLOW, *Supt.*

PERSON NOYES, Esq., EAST CAMBRIDGE, MASS., March 4, 1874.
Agent Belt and Leather Stuffing Co.:

Dear Sir: In reply to your inquiry in regard to LIQUID PACKING, allow me to say:

I have just sent in a requisition for three barrels, which I trust you have received before this. I will only say in recommending it, that it is the best article I have ever used, and our conductors and engineers all indorse my sentiments.

I have ordered eighteen more cans, which I think will meet your approbation. I intend to have one on every train, and on long trains two, and have them made with inch nozzles, and a cap attached by chain, to prevent thickening; also a packing-iron about fourteen inches long, attached to a slot in the can, to be used in stirring up the LIQUID, and also for drawing the waste out on the front side, and crowding it in on the back side, before putting the packing in. This little packing-iron I find very essential, as it is always at hand, and will prevent delay in searching for a suitable article in times of emergency. Yours truly,

JOHN F. CROCKETT, *M. M., Boston, Lowell, and Nashua R. R.*

PERSON NOYES, Esq., CHICAGO, Dec. 10, 1873.
Agent Belt and Leather Stuffing Co.:

Dear Sir: The barrel LIQUID PACKING sent on trial is approved, and you will please send us five barrels more. Yours, H. I. HIGGINS, *Purchasing Agent C., B., and Q. R. R.*

CHICAGO, March 23, 1874.

P. NOYES, AGENT: Please forward to C., B., & Q. R. R., and send bill of same to this office, eight barrels of LIQUID PACKING, same as purchased of you before, and send as soon as possible.

H. I. HIGGINS, *Purchasing Agent Quincy Railroad.*

CHICAGO, ILL., May 7, 1874.

AGENT BELT AND LEATHER STUFFING CO.:

Dear Sir: You will please forward to the C., B., and Q. R. R. ten barrels Liquid Packing.

H. I. HIGGINS, *Purchasing Agent C., B., and Q. R. R.*

MR. NOYES: FITCHBURG, MASS., Aug. 20, 1872.

Dear Sir: I have used your LIQUID PACKING for the past four months, and am perfectly well satisfied that it is the most effectual article ever in use for the purpose claimed. I have just ordered another barrel. If all railroad companies would adopt your LIQUID COOLER, I think they would find a saving of nearly 20 per cent, when used with mineral or black oil, according to your directions. JACOB MARSH, *Master Car Builder, Troy and Greenfield R. R.*

MR. P. NOYES: SALEM, MASS., Aug. 7, 1872.

Dear Sir: I have been using your LIQUID PACKING for cooling car journals, for some time past, and have been well pleased with it. I have had occasion to use it a number of times under Pullman Cars, and it has been a complete remedy in every case of hot journals.

Every train should be provided with it, as it is a saving of time and expense in the running of trains, provided it is applied and cared for according to directions for using.

J. P. SOMERBY, *M. C. B. of Eastern Railroad.*

P. NOYES, Esq: ALBANY, Nov. 1, 1872.

Dear Sir: I received the barrel of LIQUID PACKING you sent me for trial, and gave it out to our most experienced conductors, to use according to directions. Below please find their report:

"WE, the undersigned, Freight Conductors on the Eastern Division of the N. Y. C. & H. R. R. R., have used the LIQUID PACKING furnished by Mr. Jones, and find that when we arrive at a station with a hot journal, the LIQUID PACKING cools it sufficiently by the time we arrive at the next station to use the black oil, and then have no trouble in getting through with it. It is the best we ever used.—R. H. FISHER, A. W. GETMANS, R. H. HEATH, WM. HESS, Conductors E. Div., N. Y. C. R. R. I. FERGUSON, Conductor H. R. R. R."

JOSEPH JONES, *M. M., N. Y. C. & H. R. R. R., E. Div.*

Send for a Barrel. No charge unless it does all we state.

Manufactured by the Belt and Leather Stuffing Co.,

47 INDIA STREET, BOSTON.

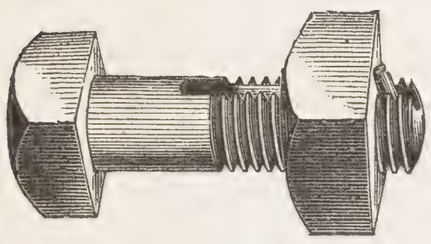
Sold by Vose, Dinsmore & Co., New-York.

Wm. Courtenay, President. Chas. F. Cobb, Secretary.

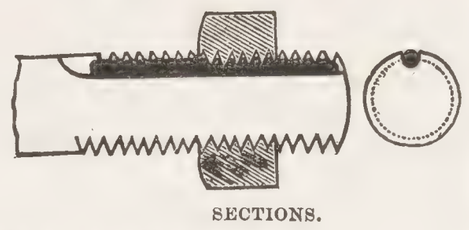
The Lock-Nut and Bolt Co., of New-York,

Office, No. 17 DEY STREET, New-York.

Manufacturers of all kinds of BOLTS, for FISH-PLATES, CARS, BRIDGES, MACHINERY, CARRIAGES, &c., with the



"Cumming Nut-lock,"
Patented
June 16, 1868,
August 23, 1870.



SECTIONS.

Unequaled for CHEAPNESS, SIMPLICITY & EFFECTIVENESS.

This simple device, as will be seen by the engravings, consists of a groove being cut in the threaded part of a screw bolt into which is placed a key of copper wire, or other soft metal; when the nut is screwed on, it cuts a thread on the key, thereby making it impossible for the key to get out until the nut is taken off. When the nut is screwed up to its place, that part of the key over which the nut has passed is riveted up against the nut with a small punch, destroying the thread on the key. The nut, therefore, can not move backward until force is used, as with a wrench.

The groove can be rapidly cut with a simple machine designed for the purpose.

Experience has proved this device absolutely reliable, and it is the cheapest of all known devices for the purpose. By its use, old bolts on which the nuts have become too slack for use can be made as good as new, making it a great saving to railroad companies and others in that item alone. It is cheaper than a check-nut.

If the bolt should become slack from shrinking of timber or other causes, *the nut will always remain firmly attached to the bolt*, and, with the wrench, can be screwed up *any distance*, and the wire riveted up any number of times, or can be taken off without injury to the nut or bolt.

This is the only method in use that locks the nut firmly to the bolt without regard to place or surroundings, all others require some attachment that holds the bolt in its position, and a washer or other attachment to keep the nut from turning.

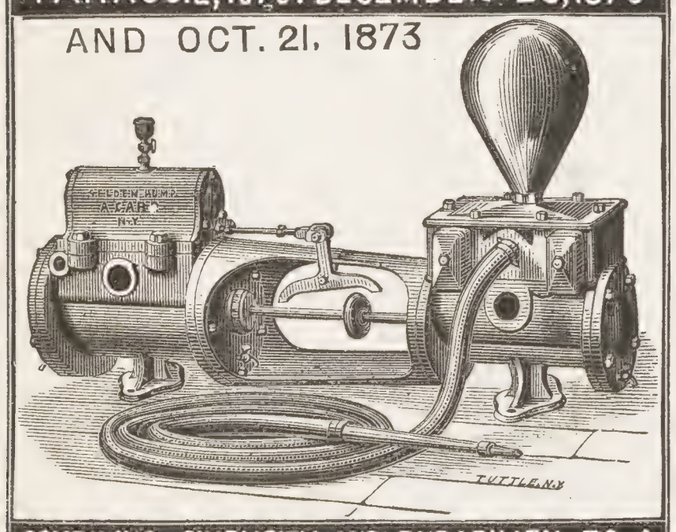
Directions for Use.—Place the copper key in the slot, pointed end out, and beveled side up, in such a position that when the nut is screwed to its place about three-eighths of an inch of the key will project beyond its outer face. Then screw the nut to its place *over the key*, allowing it to cut its own thread in the copper. Then take a narrow flat set punch, and rivet the projecting part of the key *solidly* against the outer face of the nut. To tighten the nut: screw it up, and rivet the key tighter. To remove the nut: simply apply the wrench and unscrew the nut. It will cut its own way out through the copper. The same key can be used several times, by moving it outward a few threads in the slot.

"DEAD STROKE" POWER HAMMER.

IMPROVED ADJUSTABLE CRANK PIN.
Strikes Blow Heavy or Light, Fast or Slow.
Prices Reduced Jan. 1st, 1875.
The Hull & Belden Company, Danbury, Ct.

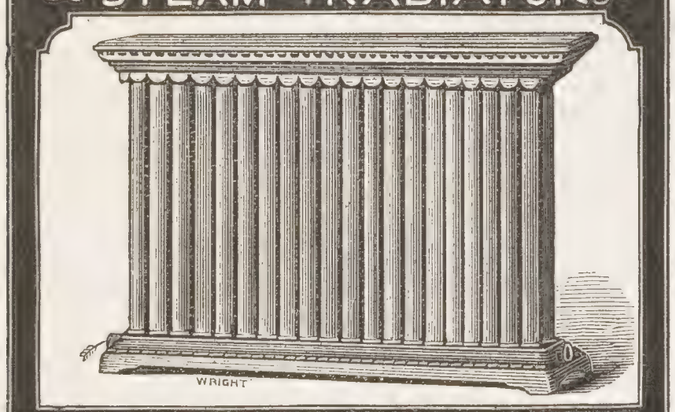
THE SELDEN DIRECT-ACTING STEAM-PUMP

PAT. AUG. 2, 1870. DECEMBER 20, 1870
AND OCT. 21, 1873



COMBINING SIMPLICITY AND DURABILITY TO A REMARKABLE DEGREE. ITS PARTS ARE EASY OF ACCESS AND IT IS ADAPTED TO ALL PURPOSES FOR WHICH STEAM PUMPS ARE USED

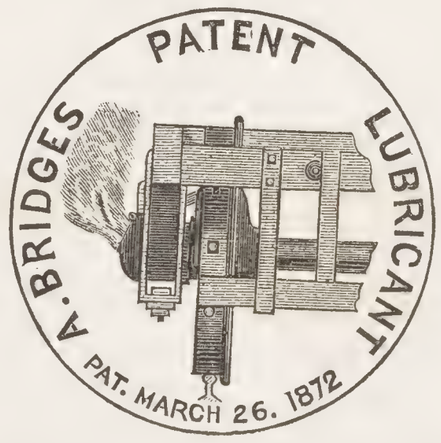
A. CARR
MANUFACTURER AND PROPRIETOR,
43 CORTLANDT ST. NEW YORK.
CARR'S POSITIVE CIRCULATING
STEAM RADIATOR



THE ONLY UPRIGHT STEAM RADIATOR MADE WHICH HAS A POSITIVE CIRCULATION.
ALSO
WROUGHT IRON PIPE, BRASS AND CAST WORK & C. FOR
PLUMBERS, STEAM AND GAS FITTERS.
SEND FOR DESCRIPTIVE CIRCULAR & PRICE LISTS

HOT JOURNALS ENTIRELY PREVENTED

BY THE USE OF



For Railroad Car Journals and other Bearings.

In presenting this Lubricant to the notice of Railroad and Steamboat Managers and Operators in Machinery generally, I do so with a practical knowledge of its merits, and with confidence that it will be found to possess invaluable qualities as a

Lubricator and Counteractor of Friction.

It has been in use, during the past two years, on a number of Railroads and Steamers, and is highly approved of.

Parties wishing to make a practical test of the Lubricant will be furnished with sample on application.

ALBERT BRIDGES, Patentee,

MANUFACTURER AND DEALER IN

RAILWAY SUPPLIES and MACHINERY,

No. 46 CORTLANDT STREET,

SEND FOR CIRCULAR. NEW-YORK.

HARRISBURG FOUNDRY

AND

Machine Company,

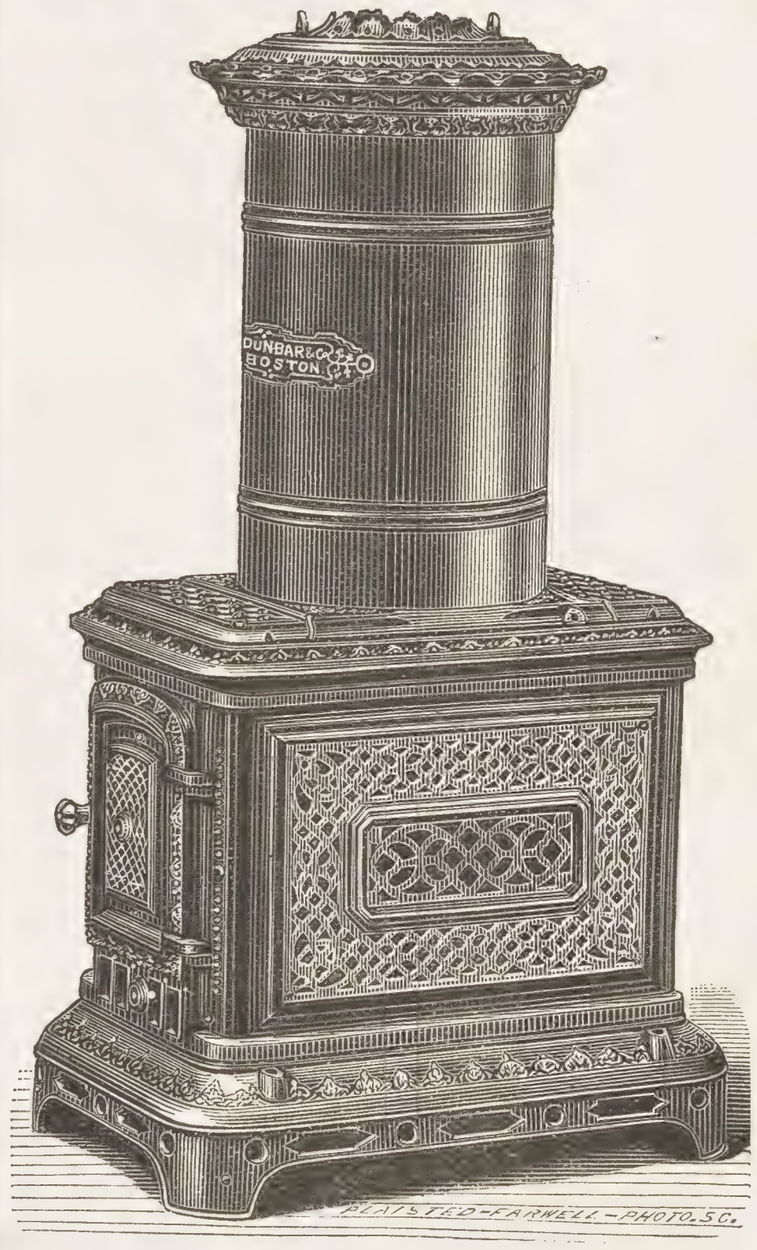
HARRISBURG, PA.

Manufacture all kinds of Machinists' and Car-Builders' Tools, for working Iron, such as Lathes, Planers, Slotting Machines, Horizontal Drilling and Boring Machines, Vertical Drills, all sizes, Shaping Machines, Bolt Cutters, Nut Tappers, Car Wheel Borers, Hydraulic Wheel Press, Axle Lathes, etc. Patent Sectional Tubular Boiler, safety and great economy at moderate cost.

Also Oil Tank Cars, Boiler and Sheet Iron work of all kinds, Foundry Cupolas, Cranes, Ladles, etc.

SAMUEL FISK, General Manager.

GEO. DUNBAR & CO.'S Railway-Car Stove.



The above cut represents our new Railway Wood-Burning Car Stove, which for Style and Economy is unsurpassed by any in the market.

GEO. DUNBAR & CO.

Dealers in

General Railroad Supplies,

19 FEDERAL ST., BOSTON.

General Selling Agents for Boston Car-Spring Co. and Chrome Steel Co.



Union White Lead Manufacturing Co.,

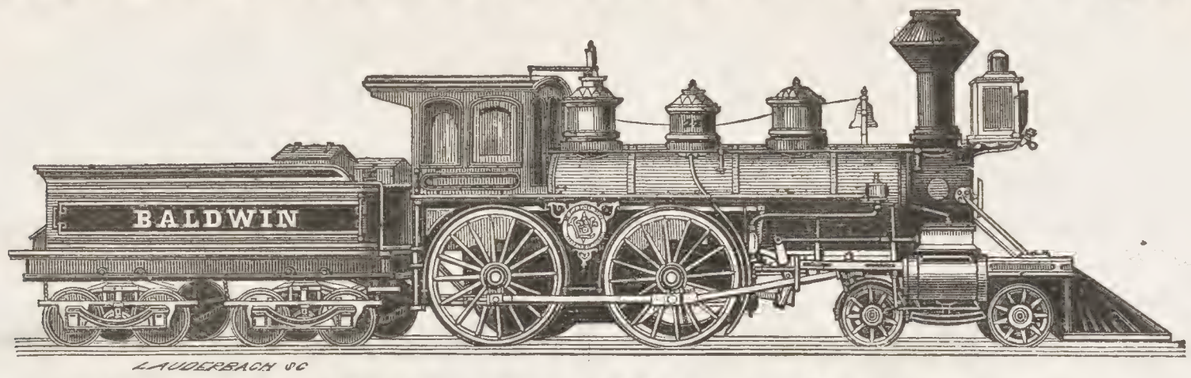
26 Burling Slip, New-York.

B. W. HOW, Secretary. JAMES HOW, President.

MANUFACTURERS OF

WHITE LEAD, RED LEAD, LITHARGE, ORANGE MINERAL.

BALDWIN LOCOMOTIVE WORKS.



LAUDERBACH SC

BURNHAM, PARRY, WILLIAMS & CO., Philadelphia,

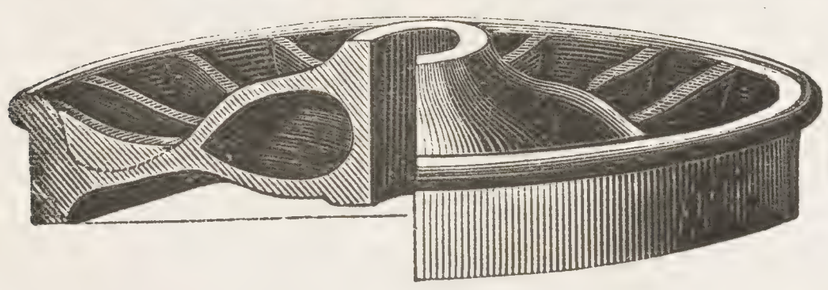
MANUFACTURERS OF

LOCOMOTIVE ENGINES,

Especially adapted to every variety of Railroad use, including Mine Engines and Locomotives for Narrow-Gauge Railways.

☞ *All Work thoroughly interchangeable.* ☜

GEO. BURNHAM, CHAS. T. PARRY, EDWARD H. WILLIAMS, WM. P. HENSZEY, EDWARD LONGSTRETH, JOHN H. CONVERSE.



WASON

Manufacturing Company,

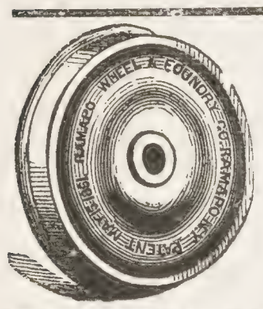
SPRINGFIELD, MASS.

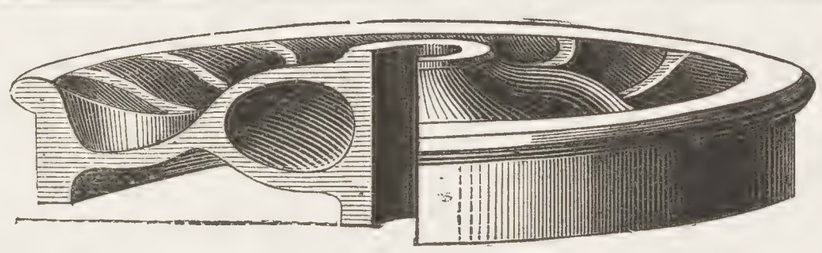
BUILDERS OF

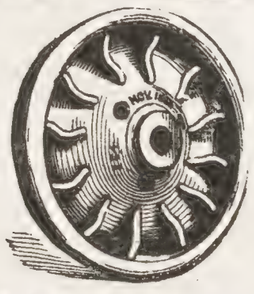
RAILWAY CARS OF ALL DESCRIPTIONS,

CAR WHEELS AND RAILWAY CASTINGS.

H. S. HYDE, Treasurer. G. C. FISK, President.







RAMAPO WHEEL AND FOUNDRY CO.,

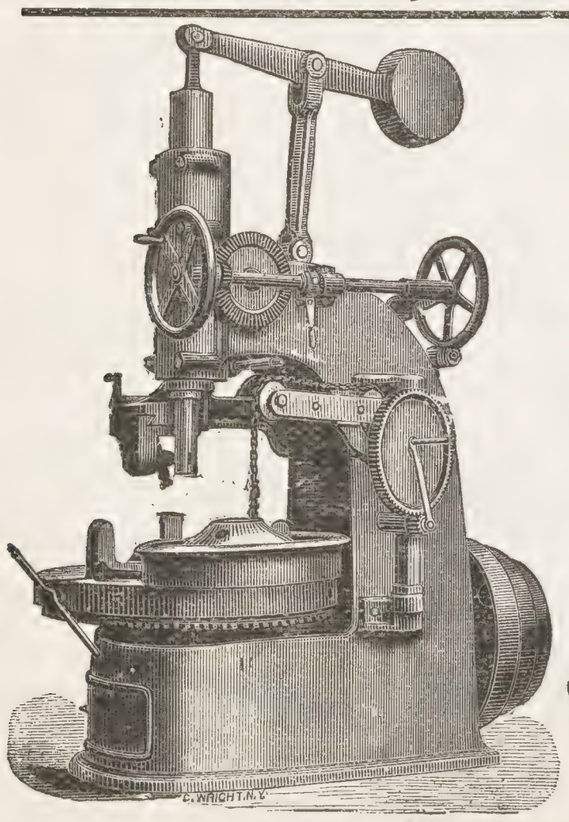
MANUFACTURERS OF

Chilled Wheels for Drawing-Room and Sleeping Coaches,

LOCOMOTIVES, TENDERS, PASSENGER AND FREIGHT CARS.

GEO. CHURCH, Pres't and Treasurer. W. W. SNOW, Sup't and Gen'l Manager.

RAMAPO, ROCKLAND COUNTY, N. Y.



NEW-YORK STEAM ENGINE CO.
MANUFACTURERS OF
MACHINISTS' TOOLS
OF ALL DESCRIPTIONS
CHAS. A. CHEEVER, TREAS. No. 98 CHAMBERS ST
GEO. Q. DOW, SEC'Y. NEW-YORK

WE HAVE THE BEST AND MOST COMPLETE ASSORTMENT OF

MACHINISTS' TOOLS

IN THE COUNTRY, COMPRISING ALL THOSE USED IN

MACHINE, LOCOMOTIVE, AND CAR SHOPS.

WE MAKE A SPECIALTY OF MANUFACTURING

GEAR WHEELS OF ALL DESCRIPTIONS,

WHICH ARE MADE ABSOLUTELY PERFECT WITH OUR

PATENT MOULDING MACHINE.

☞ FOR PHOTOGRAPHS, PRICES, AND DESCRIPTION, ADDRESS

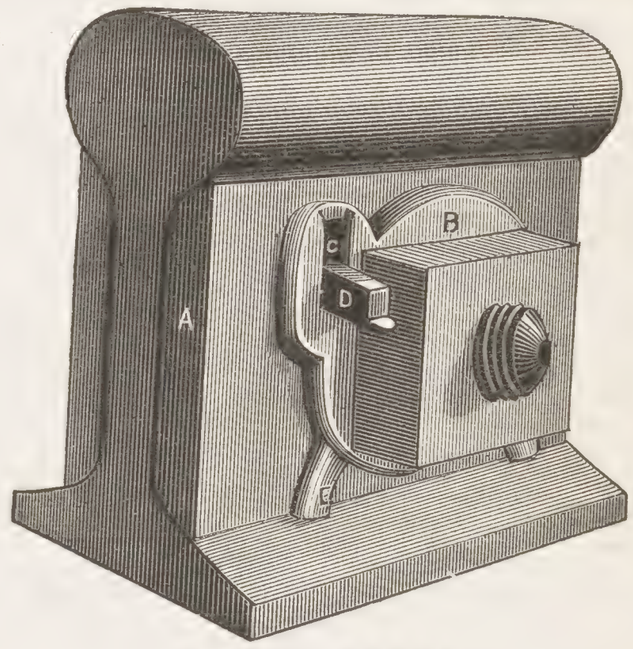
NEW-YORK STEAM ENGINE CO.,

98 CHAMBERS STREET, NEW-YORK

PURDIE'S PATENT

Safety Washer,

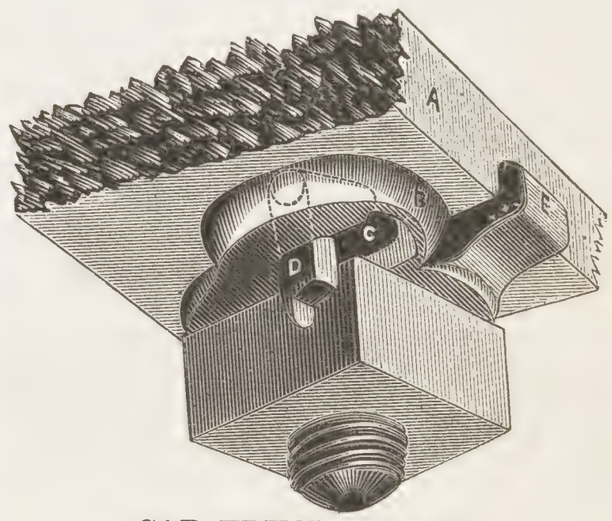
A Positive Nut-Lock, made of Malleable Iron.



For FISH PLATE.

EXPLANATION OF CUT.

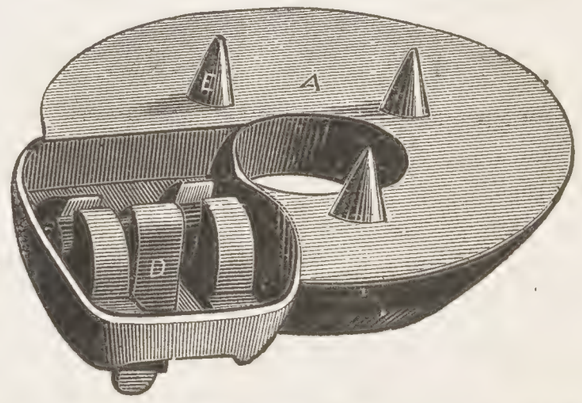
A, Fish plate. *B*, Washer, with projecting feet. *C*, Cavity into which the dog, *D*, swings, on screwing up the nut. *D*, Pivoted dog which falls by side of nut when screwed home.



CAR TRUCK Washer.

Adapted for use on fish-plate bolts, car trucks, wagons, mowing machines, wood-work of all kinds, or for any purpose where bolts and nuts are used.

Cheap, Effective, and Durable.



Reverse side for WOOD-WORK, showing Method of Pivot Swing.

Will fit on old or new work, no alterations or special tools needed, requiring no rubber or wood for compressing or bending to hold the nut. The dog being in position to lock at any time required, by turning down by the side of the nut when screwed home; should the bolt or thread give any, so as to become loose, the dog will still hold the nut from turning back, and the nut can be screwed up as readily as by the old method.

Have been practically tested for two and a half years on many Railroads, giving unqualified satisfaction, one Railroad alone having them on over 2,500 cars.

Cast-iron washers for timber or bridges furnished to any size or weight.

Samples and price-lists forwarded on application to

JOHN PURDIE,

MANAGER OF

Safety Washer Manufacturing Company,

No. 311 MAIN STREET,

BUFFALO, N. Y.

J. F. SULLIVAN,
DESIGNER AND ENGRAVER ON WOOD
No. 23 JOHN ST. NEW YORK

SOLID HEAD
NICKEL-PLATED SCREWS.
ADAMS NICKEL-PLATING and MFG. CO.
South Windham, Ct.

THE
PETERSBURG CAR COMPANY,
Petersburg, Va.,
Are now ready to receive orders for all kinds of
FREIGHT CARS.
These works are supplied with the most improved machinery, and have switch connections with broad and narrow gauge. They are prepared to furnish Rolling Stock with the utmost promptness, of the best materials and workmanship, and at the lowest prices.
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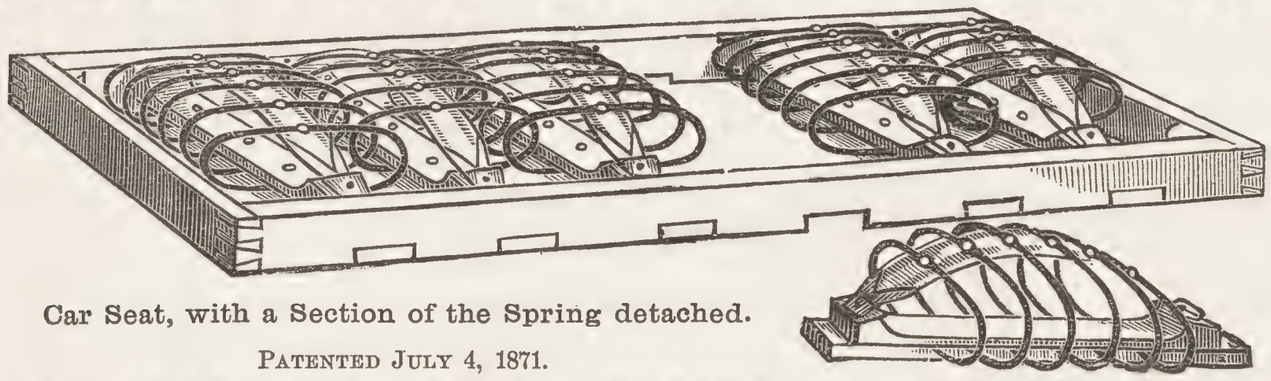
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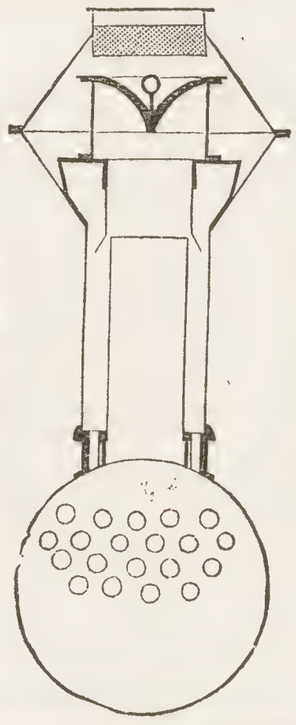
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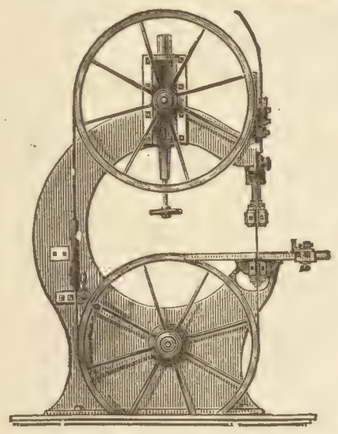
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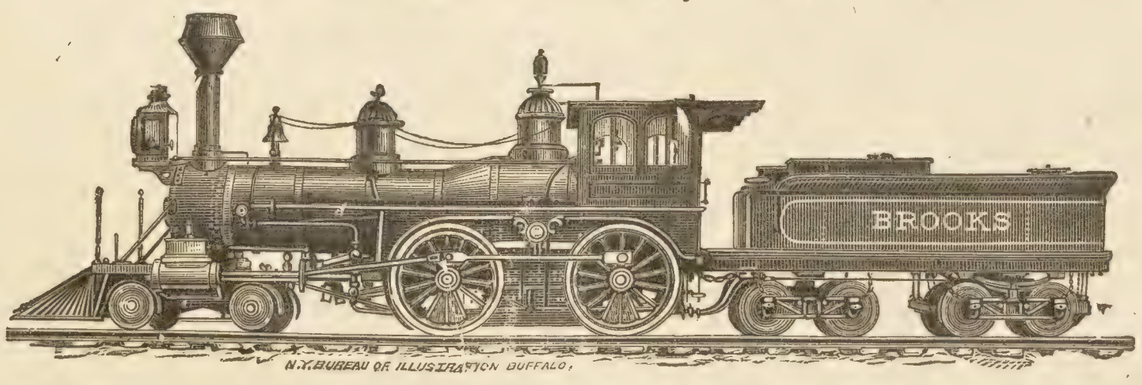
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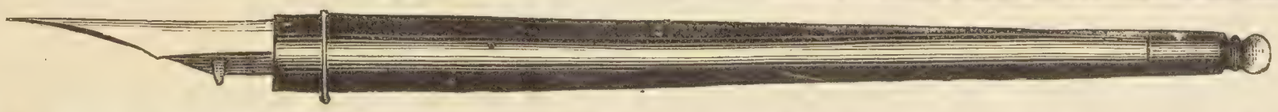
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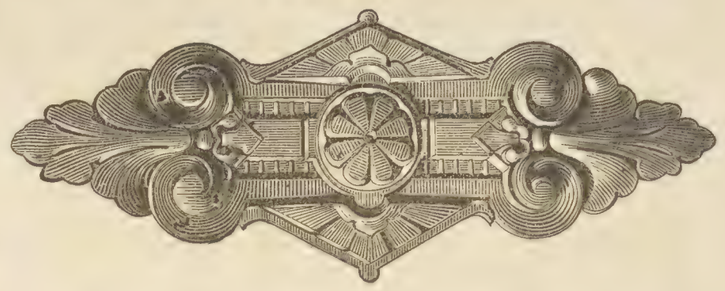


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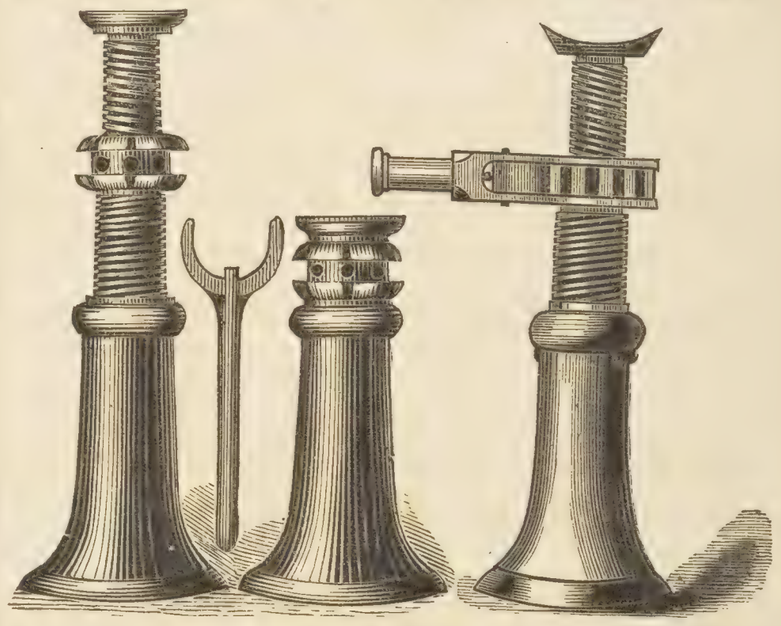
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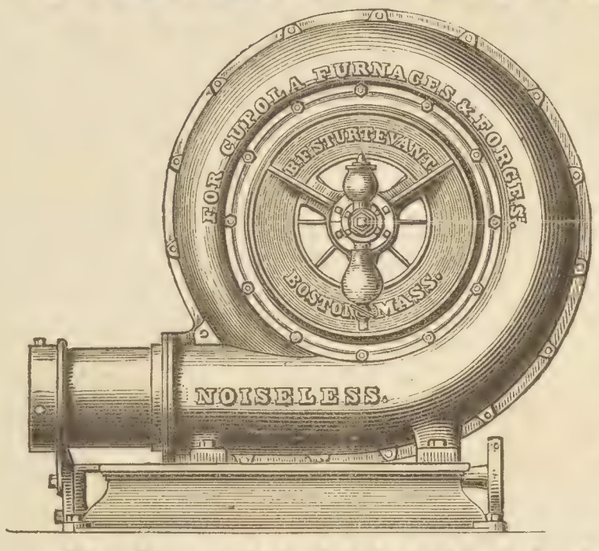
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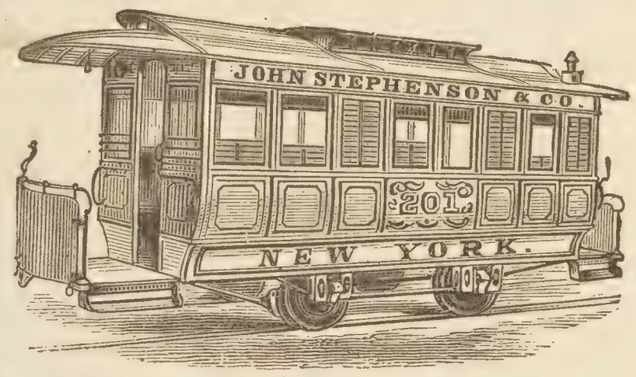
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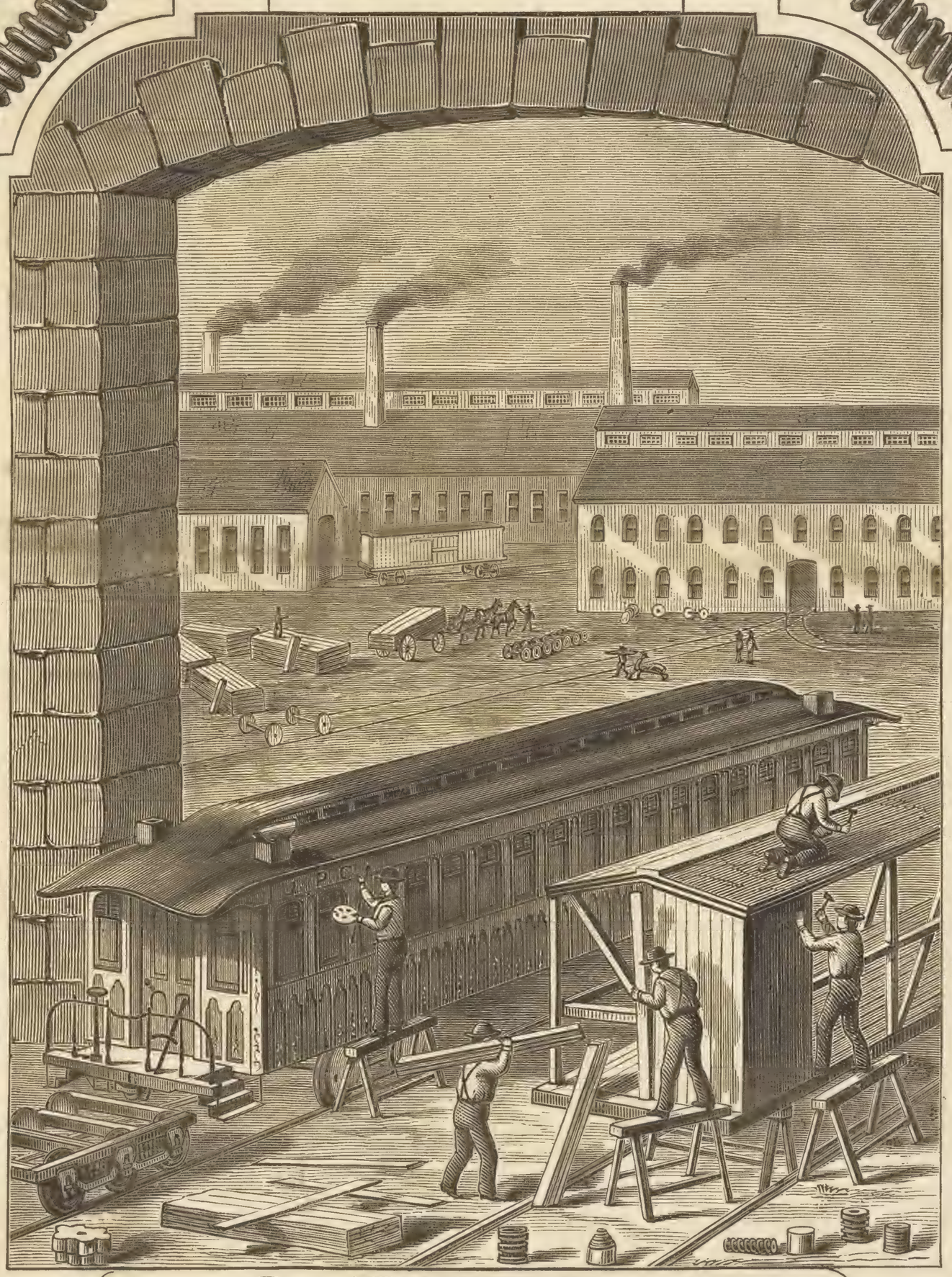
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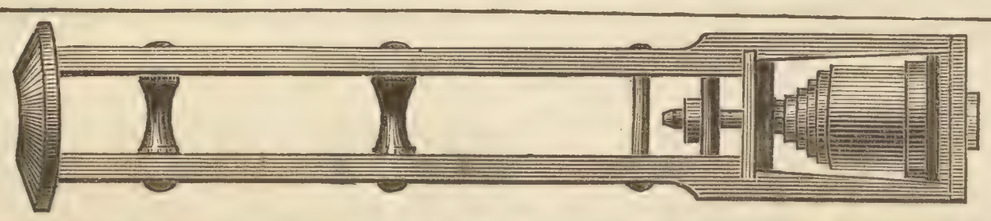
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The blast is strong, and sufficient to keep up any required amount of heat. The fire-pan is covered with a hood of cast-iron, with doors for passing the rivets.

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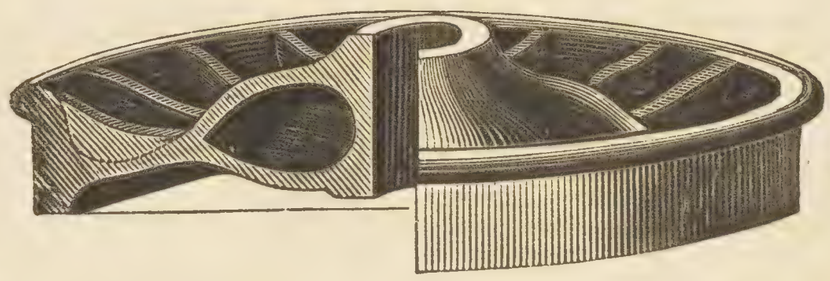
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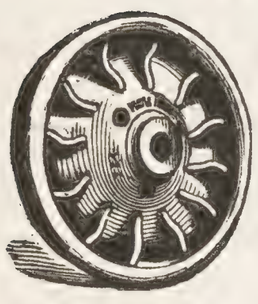
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WHEELS



FOR

Locomotive Trucks, Tenders, Passenger, Freight and Coal Cars

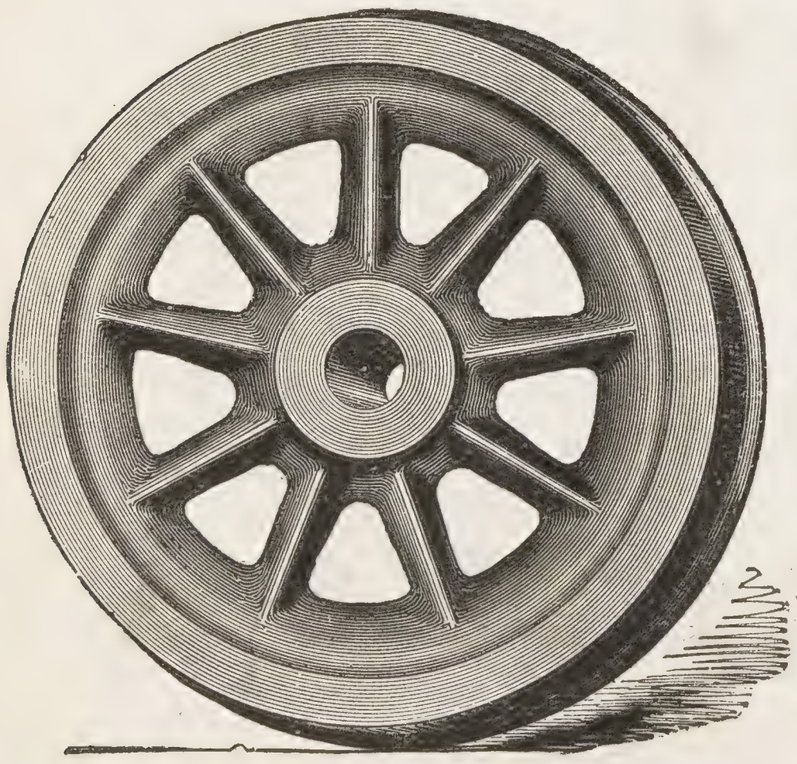
WHEELS FITTED TO AXLES,

AND AXLES FURNISHED, IF DESIRED.

CASTINGS for all kinds of CARS, MINE CAR WHEELS, ETC.

MOSES LYMAN, President. W. W. SNOW, Vice-President. M. LYMAN, Jr., Treasurer.
W. H. WILLIAMS, Secretary. REGINALD CANNING, Manager.

Baltimore Car-Wheel Company,
OFFICE, 15 SOUTH STREET.



Manufacture Wheels

FOR

City and Steam Railways,

WITH OR WITHOUT AXLES.

WHEELS

OF ALL PATTERNS

MADE TO ORDER,

AND IN STOCK.

This Company using strictly Baltimore Charcoal Iron, which has no superior and few equals, for making Car-Wheels,) and annealing their Wheels by the most approved process, warrant them free from strain, and equal in tenacity and uniformity of chill to any made.

W. S. G. BAKER, Pres't.
J. M. LAWFORD, Sec'y.

Works, cor. Essex and Concord St., Canton, Baltimore, Md.

TODD'S
Patent Coupling,
FOR FREIGHT CARS.

First. It is self-coupling; perfectly simple; requires no pins; always sure and couples readily with any car having the ordinary draw-bar.

Second. The expense is but a trifle more than the ordinary coupling, and will be saved in pins and links alone in a very short time, there being a link always in reserve, ready for use, without liability of being lost or stolen.

Third. The saving of time is also a great consideration, as the engineer alone can couple a train of cars in much less time than with the aid of two or three men with the ordinary coupling.

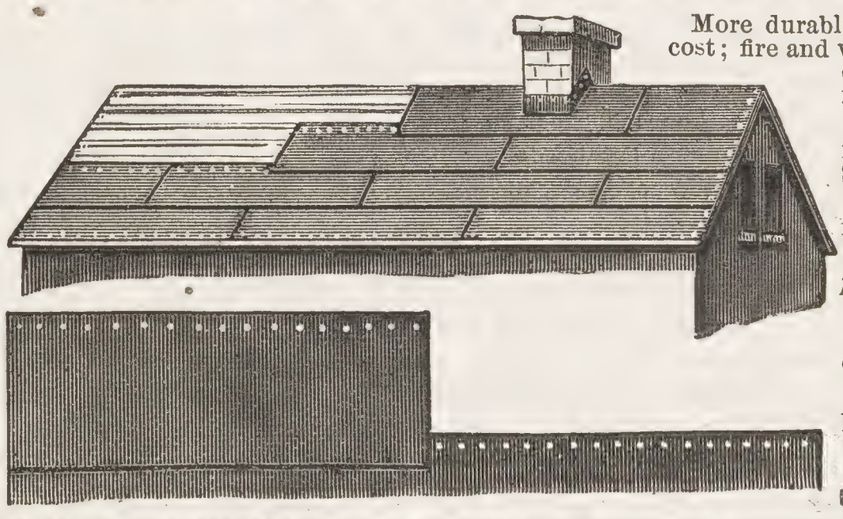
Fourth. There is no going between the cars to shackle or unshackle; *it is entirely safe, always ready, always sure.* To companies desirous of testing the coupling, one or more castings will be furnished gratuitously, for trial.

The Boston and Albany Railroad Co., after a thorough trial, being satisfied of its utility, have purchased the right for their road, and we are permitted to refer to the officers and employés of the road, who have given attention to it.

For further information respecting it, address

WILLIAMS, PAGE & CO.,
BOSTON.

EGYPTIAN ROOFING.



More durable than tin; one-half the cost; fire and water-proof; will not run or crack; for steep or flat roofs.

Unequaled for Covering Railroad Cars and Steamboat Decks.

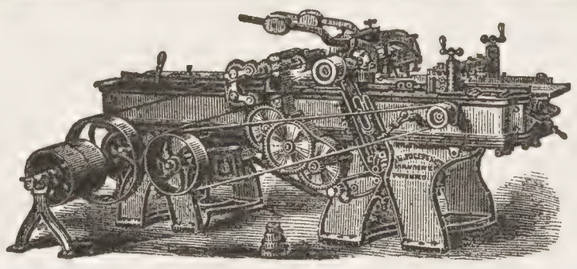
Can be laid by inexperienced persons.

Roofing Shipped to any part of the Country.

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Office, 105 N. Fourth St.
FACTORY,
Berks St., above Ninth,
PHILADELPHIA.
☞ SEND FOR CIRCULAR

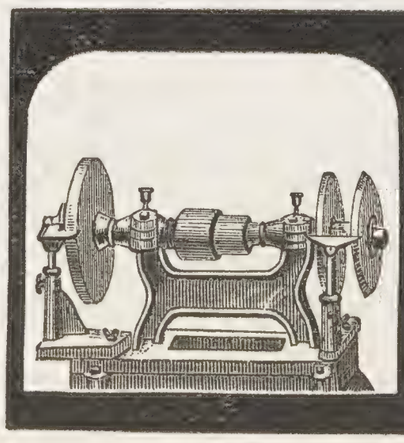
FERRIS & MILES,
TWENTY-FOURTH AND WOOD STS., PHILADELPHIA, PA.
(Take Arch, or Race and Vine Street Cars.)

Steam Hammers, Drops, etc. Engine Lathes, Axle Lathes, Cut-off and Centreing Lathes, Patent Screw-Cutting Lathes, Planing and Slotting Machines, Wheel Borers and Wheel Pressers, Upright Drills, with Patent Universal Tables, Radial Drills.



FACTORY: NORWICH, CONN.

C. B. ROGERS & CO.,
MANUFACTURERS OF THE LATEST IMPROVED
Wood-Working Machinery
Especially for Car Builders and Railroad Shops. Price-Lists Supplied
Warerooms: 109 Liberty St., N. Y.



NORTHAMPTON
EMERY WHEEL CO.
MANUFACTURERS OF
PATENT SOLID EMERY WHEELS
RINGS, ROLLS, & EMERY WHEEL
MACHINERY OF ALL KINDS.
LEEDS, *MASS.*

FULLER, LORD & CO.,

Machine-Forged Nuts.

BOLTS and NUTS,

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BOONTON CUT NAILS,

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E. C. WALKER, Pres. and Treas. D. SUTHERLAND, Manager. GEO. H. RUSSELL, Secretary.

DETROIT CAR WORKS,

MANUFACTURERS OF

CARS

OF EVERY DESCRIPTION.

Office and Shops on Adair Street, near Jefferson Avenue,

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Hitchcock Car Ventilator.

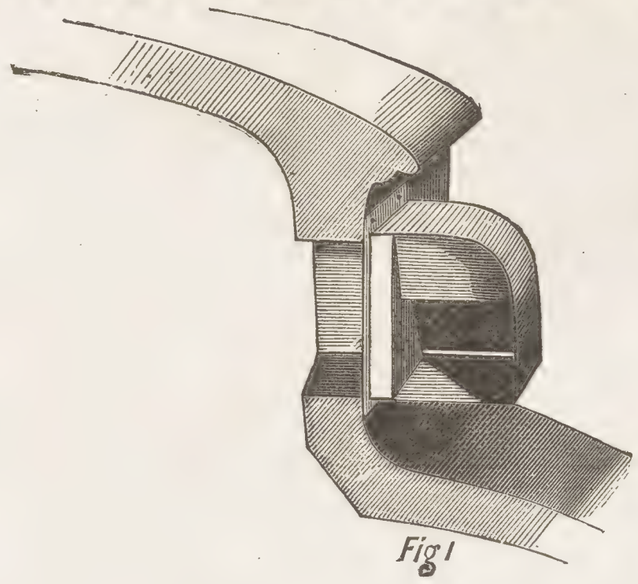


Fig 1

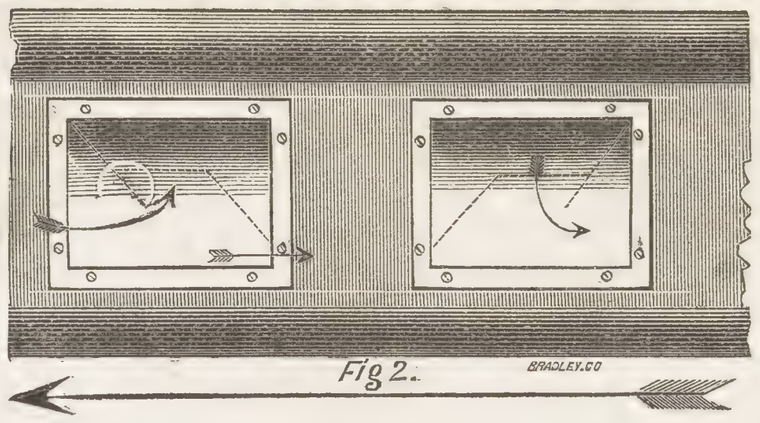


Fig 2.

THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place, it is always in readiness, and runs itself independent of all employees.

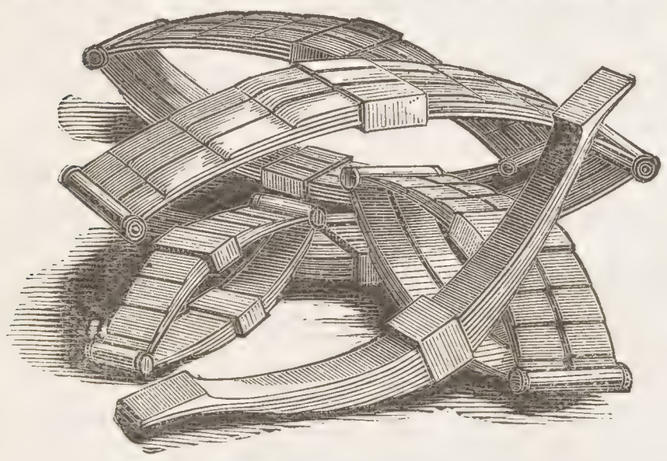
H. D. CARROLL & CO., Springfield, Mass.,

Proprietors and Manufacturers.

ROBERT HITCHCOCK, Inventor.

HALF AND FULL CAST-STEEL

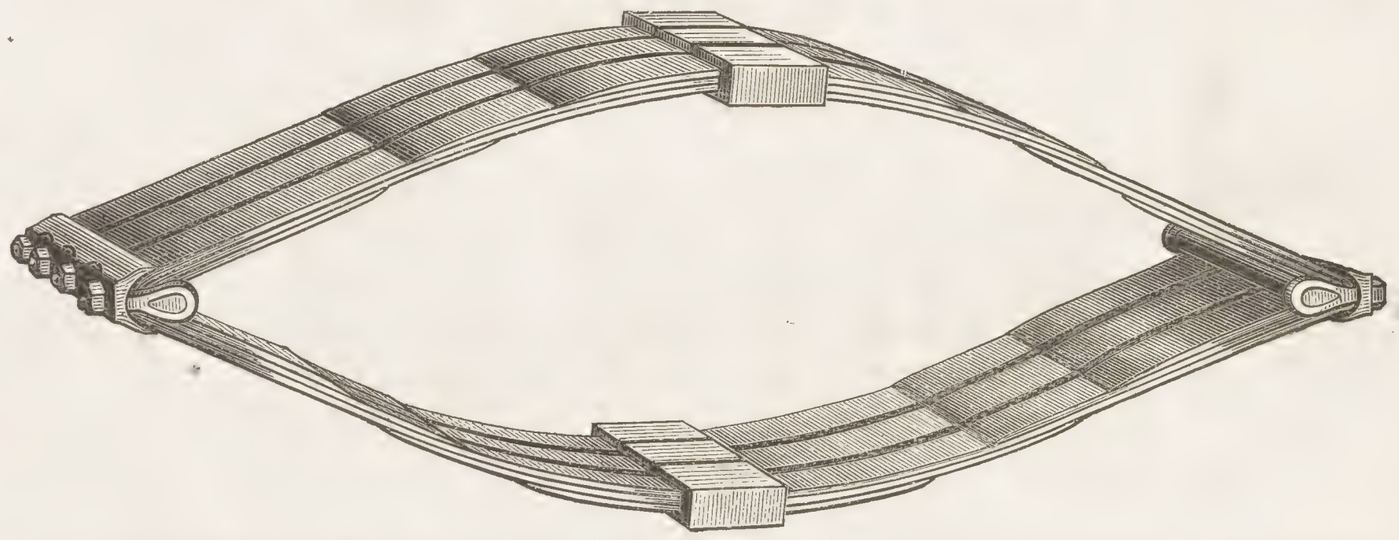
ELLIPTIC SPRINGS.



Our own manufacture; light, extra tempered, and made of best material. Equal to any in the market.

CLIFF'S PATENT ELLIPTIC CAR-SPRING,

For Freight or Passenger Service.



A continous leaf or bed-plate upon which all the short leaves work, securing a uniform pressure. Equally durable with ordinary elliptics, and saves thirty per cent of dead weight. In successful operation on a number of roads. Made of best cast steel. CHEAPER, LIGHTER, MORE ELASTIC.

VOSE, DINSMORE & CO., 32 Warren Street, N. Y.

DELAWARE CAR WORKS.

[Working Capacity, 1000 Men.]

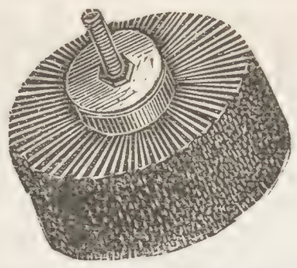


Manufacturers of Sleeping, Saloon, Drawing-Room, Passenger, and Freight Cars of Every Gauge.

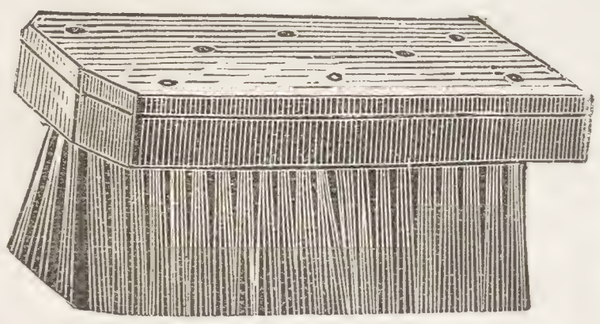
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Steel Wire Broom AND Brush Works
MANUFACTURERS OF
FOUNDRY CASTING BRUSHES,
Boiler Flue and Tube Brushes,
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STEEL WIRE SWEEPING BROOMS.

These goods are used by all the principal Railroads, Manufacturers, and Foundries throughout the United States and Canada. They are made of the very best English Refined Spring Steel Wire, and are warranted to give entire satisfaction. All orders will meet with prompt and careful attention, by addressing

199, 201, and 203 RANDOLPH STREET,
CHICAGO, ILL.



6-inch Boiler Flue Brush.



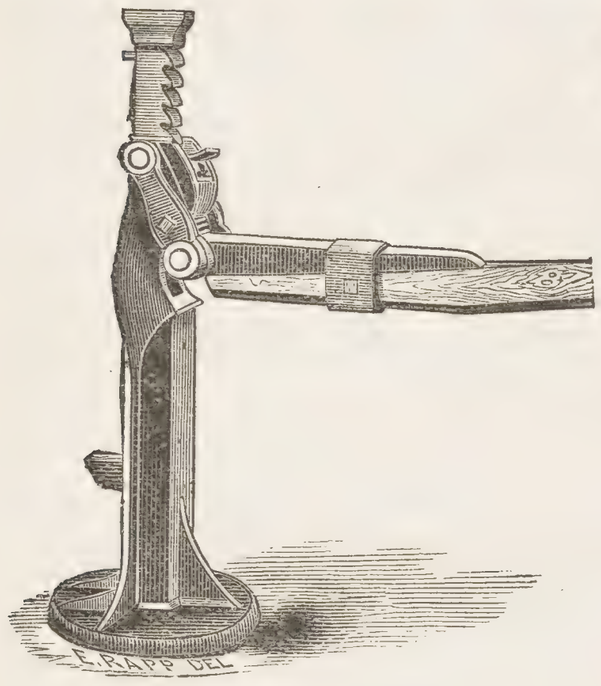
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BABBITT'S BOLT-CUTTER.



This is one of the best and most complete ***Bolt-Cutting Machines*** in the market. It will cut all sizes, from ¼ upward to 3 inches, and has no equal in practical efficiency and economy of running, as well as ready adaptation to all kinds of work occurring in a Machine Shop. Two sizes are made, Nos. 1 and 2 *Send for Circular.*

P. HICKEY, Auburn, N. Y.,
Sole Manufacturer.



Leffel's Patent Lever Jack.

Patented Dec. 10, 1850; Patented Nov. 15, 1864; Renewed Nov. 28, 1864.

ADAPTED TO ALL KINDS OF LIFTING,

BUT ESPECIALLY TO

BRIDGE AND RAILROAD WORK.

Nearly all the Railroads in the United States have these Jacks in use, and the testimony in every instance shows a very great economy in

LABOR, TIME, AND EXPENSE.

Orders solicited and promptly filled. Address,

JAMES LEFFEL & CO.,
Springfield, Ohio, and
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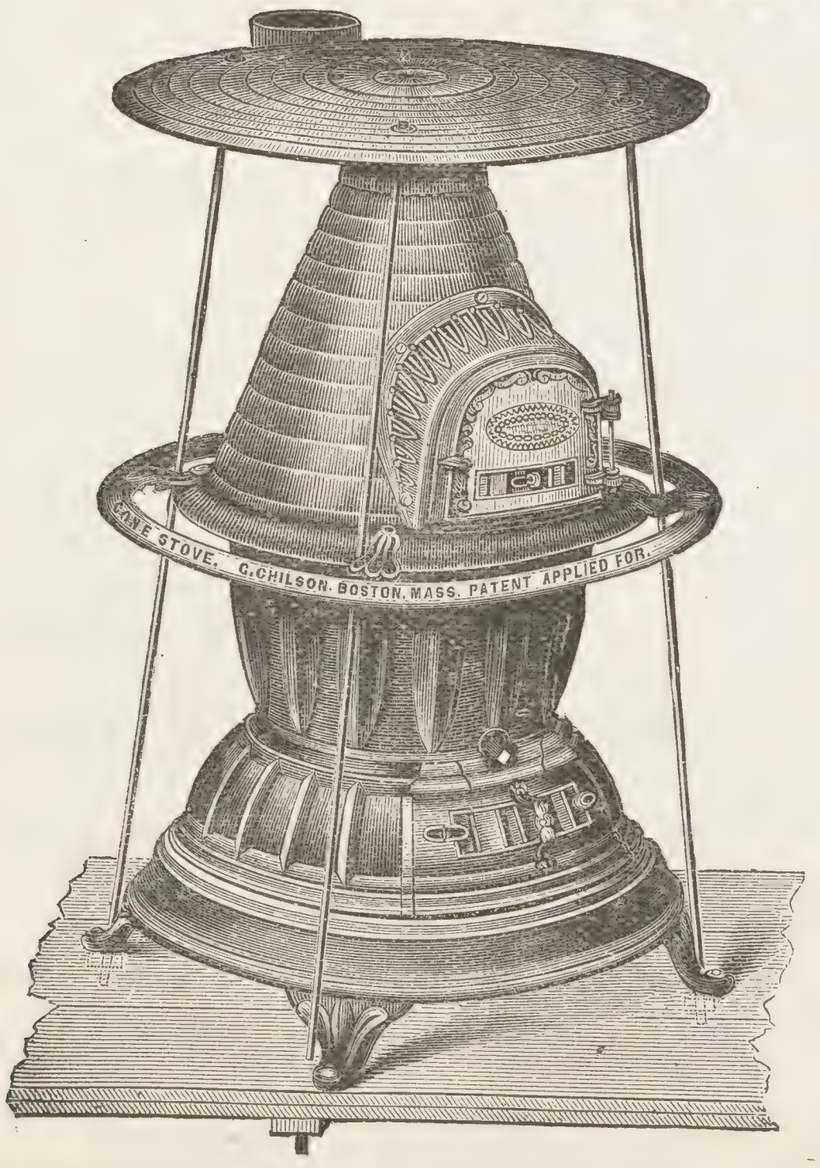


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at reasonable rates.

A NEW RAILWAY CAR STOVE.

Chilson's Patent Cone Disk Stove

ON A NEW AND MODEL PLAN.



I WOULD respectfully call the attention of Railway Managers and others interested in warming Railway Cars, Station Houses, etc., to this Stove, which has been thoroughly tested on several of our railways for a few years past, and has proved in every instance the most successful plan yet devised for thoroughly warming Railway Cars. This Stove is on a new and model plan, differing in principle and operation from all others in the United States. I claim for it *Safety, Economy, Durability, Simplicity, Cleanliness, and Beauty of Design.* Its peculiar merits may be stated as follows:

1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.
2. The broad radiating disk prevents the heat from ascending to the upper part of the car or room, but distributes and throws it down to the floor, thoroughly warming the lower currents of cold air in the car or room for a great distance around the Stove, thus securing the long desired object of making the *lower part of the car and floor comfortably warm, especially for the feet.*
3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stoves.
4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.
5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*
6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories, Stores, Offices,* RAILROAD CARS, and STATION HOUSES, *School Rooms, Workshops, etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

The BOSTON AND PROVIDENCE RAILROAD COMPANY have over two hundred of these Stoves in use, and the BOSTON AND ALBANY and several other Roads are adopting them, with the most perfect success.

BOSTON AND PROVIDENCE RAILROAD CORPORATION,
Superintendent's Office, Boston, April, 1873.

GARDNER CHILSON, Esq.: *Dear Sir:* We have about two hundred of your new "Cone" Disk Stoves in use, (a part of them for nearly five years,) for warming Passenger Cars and Stations. I can truly say that they have given entire satisfaction. These Stoves possess many important advantages over any other we have ever used, viz.: for warming the floor and displacing the cold air in the lower part of the car, whereby they are rendered much more comfortable, especially for the feet, than by any other plan known to us. The Stove is more economical in the consumption of fuel, more substantial in construction, and consequently requiring less repairs than any other in use, and so securely constructed as to prevent fire from getting out of the stove even should the car be *overturned.* I cheerfully give my testimony in favor of this Stove, and commend it to all Railroad Managers.

Yours, etc.,
A. A. FOLSOM, *Superintendent.*

Numerous other testimonials received from Railroads and other persons having these Stoves in use in Halls, Stores, etc., may be seen at office. Bolts are not required except for Cars and Steamboats.

Chilson's Improved Celebrated Cone Furnaces, for setting in Brickwork or in Portable Casings, Chilson's Unrivaled Double-Oven Brick Cooking-Range; Chilson's New and Splendid Arlington Portable Range; Chilson's very Superior Arlington Cooking Stove; Parlor, Office, and Store Stoves, Parlor Grates, Registers, Ventilators, etc.

Special attention given to putting up Furnaces and Ranges, and the ventilation of buildings in any part of the country.
☞ Nothing but strictly first-class work is manufactured by me. ☜

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FOUNDRY AT MANSFIELD, MASS.

GARDNER CHILSON.

RAWLINS' METALLIC PAINT,
WYOMING.

Warranted Fire, Water, and Weather Proof.

Will cover more surface and outwear any paint manufactured.

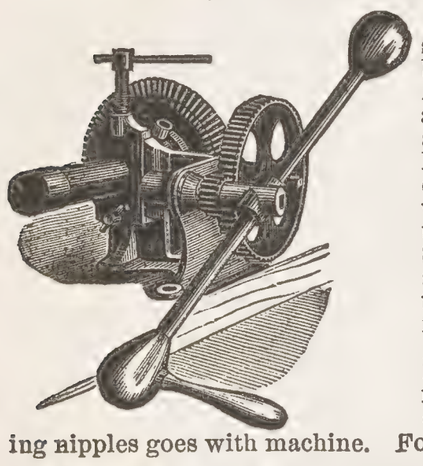
CHICAGO, BURLINGTON, AND QUINCY RAILROAD,
MASTER PAINTER'S OFFICE,
AURORA, ILL., March 15, 1875.

RAWLINS' METALLIC PAINT CO.

GENTLEMEN: I have had your IRON PAINT in test for about six months, and find it one of the best, if not the best, Iron Paints I have ever seen. *I put two coats of it, mixed with boiled oil, on a piece of sheet-iron, and buried it in* STRONG BRINE, *about six months ago, and it has stood the test, and* DOES NOT SHOW ANY SIGNS OF RUSTING THROUGH THE PAINT. I have also used it on Locomotive work, and find that it COVERS FAR MORE SURFACE than any Iron Paint I have used.

Very respectfully yours,
D. C. COOLEY.

CHASE'S
Pipe-Cutting and Threading Machine.
(W. D. CHASE'S PATENT.)

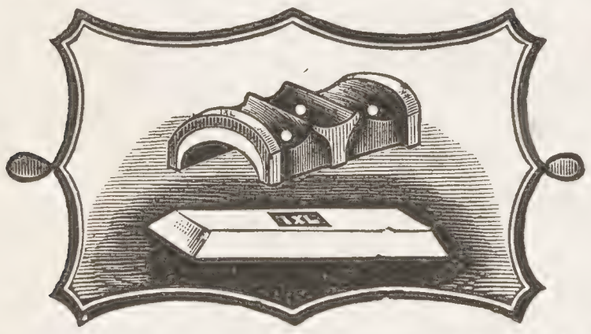


This important tool is designed to fill a want long felt by STEAM AND GAS FITTERS AND MACHINISTS for cutting and threading pipes rapidly and cheaply. An Apprentice Boy, with one of these, can do more work than Two Men with old appliances under the old system. No PIPE SPLITTING! NO BEVEL INSIDE OR OUT! It cuts threads and makes nipples for all sizes of pipes, from ⅛ to 2 inches. Weighs only 100 lbs. Stronger than any machine made. A full set of collars and lengths for making nipples goes with machine. For Sale by

MORRIS, TASKER & CO., Philadelphia, New-York, and Boston.
Address.

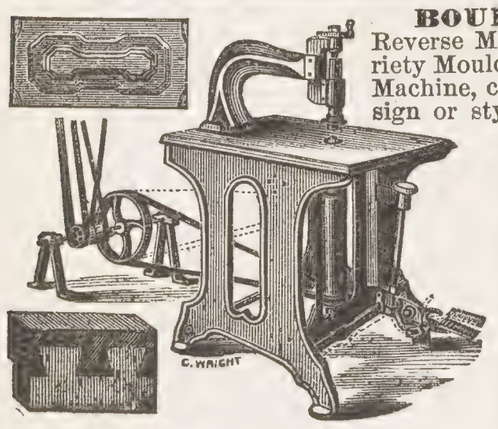
The Chase Manufacturing Co.,
120 Front St., New-York.
Send for Circular.

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OFFICE AND FOUNDRY,
No. 7 North Third Street, ST. LOUIS, MO.
Sole Proprietors and Manufacturers of the
I X L ANTI-FRICTION METAL
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Railroad Companies will find a great saving in their expenses, and very little trouble from hot boxes, by using these bearings. A sample set for a trial sent free of charge, by sending a Brass for pattern. Mills, Steamboat Companies or others, will find this a superior Composition for Bearings.



BOULT'S PATENT
Reverse Motion, Paneling, Variety Moulding and Dovetailing Machine, cuts Panels of any design or style of Mould in the solid wood, with neatness and dispatch.

Routes and grooves for Windows, Stairs, Cars, Bridges, etc., etc.

Moulds, fine Bracket and general Scroll Work. It is a first-class Shaper and Moulder, Dovetails all kinds of Drawer and Joint Work with thick or thin stuff. Warranted Simple, Durable and Efficient. Send for circular and sample of work. Manufactured only by B. C. MACH'Y CO., Battle Creek, Mich.

IRON CLAD PAINT.



Address IRON CLAD PAINT COMPANY,
CLEVELAND, OHIO.

This Company owns and manufactures under WM. GREEN'S several patents, and is the only Company in the world that makes Paint from pure hard Lake Superior Iron Ore, such as is used in furnaces for making Pig Iron.

The most Economical, Most Fireproof,
Most Waterproof, Most Durable,
and Most Useful Paint made.

Used by L. S. & M. S. RY.	I. & ST. L. R. R.
D. & M. RY. O. & M. RY.	C. C. C. & I. RY.
The K. P. R. R. CO.	L C. & L. R. R.
T. W. & W. RY.	L. S. & T. V. R. R.

Etc., etc.

OFFICE OF PURCHASING AGENT
LAKE SHORE AND MICH. SOUTHERN RAILWAY,
CLEVELAND, O., Sept. 12, 1873.

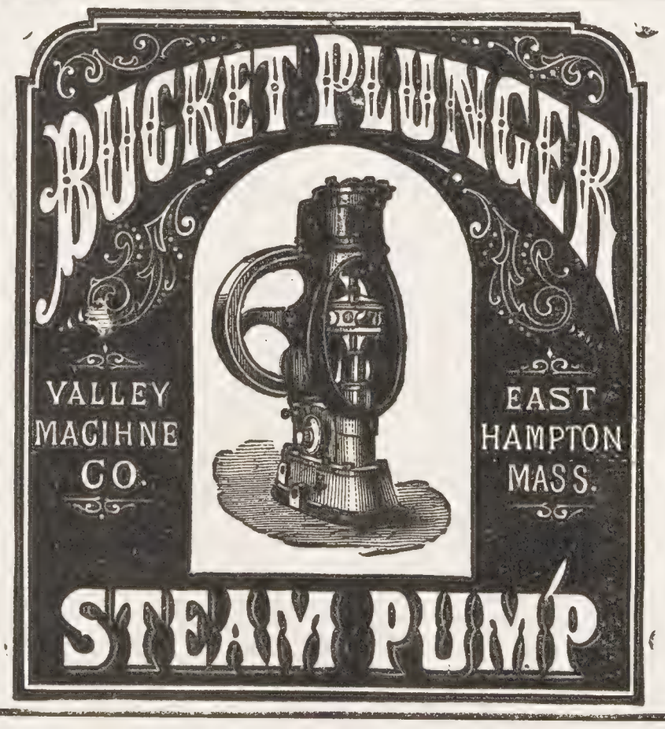
IRON CLAD PAINT COMPANY, CLEVELAND, OHIO:

GENTLEMEN: Your "Metallic Paints" known as "*Iron Clad Paints*" have, in the past six years, been extensively used and thoroughly tested by this Company, as to their *covering capacity, durability, and resistance to atmospheric changes*—latter "paint destroyer"—the most difficult to overcome in outside paints. We can emphatically accord them the highest position over any paint heretofore produced, for Cars, Roofs, Stations, Bridges, etc. The monthly increase of our orders is the best evidence that the Paint is constantly growing in favor with our mechanics.

Very respectfully yours,
A. C. ARMSTRONG,
Gen'l Purchasing Agent L. S. & M. S. R. R.

Brinckerhoff, Turner & Co.,
Manufacturers and Dealers in
COTTON DUCK,
For Car Covering and Car Seats,
14 to 150 inches wide. Also Agents
UNITED STATES BUNTING COMPANY.
A full supply, all Widths and Colors, always in Stock.
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E. A. BRINCKERHOFF,
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HERRICK'S CAR WORKS,
OSWEGO, N. Y.,
Are in full operation and stocked with selected material for manufacturing
Box, Platform and Coal Cars
Prices and terms to suit the times. Orders solicited. Address,
WM. H. HERRICK, Proprietor.

RICHARD DUDGEON,
No. 24 Columbia Street, New-York,



Maker and Patentee of
Hydraulic Jacks and Punches,
BOILER TUBE EXPANDERS,
AND DIRECT-ACTING STEAM HAMMERS.
Communications by letter will receive prompt attention.
Jacks for pressing on Car-Wheels or Crank Pins made to order.

WALL'S MAGIC RENOVATOR.

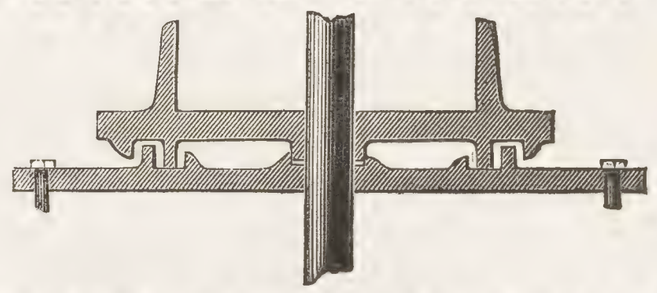
For Cleaning and Polishing Gold, Silver, Nickel, Brass, Copper, and Lacquer Gilt on Metals. A chemical liquid free from acids, which will remove all tarnish, dirt, and grease, from whatever cause, almost instantaneously, and without injury to the metal.

Price, per gallon, $5; in pint bottles, $1; ½ pint, 50 cents. Discount of five per cent on orders for ten gallons. A liberal commission to Agents.

Samples sent on application to

JAMES J. WALL,
P. O. Box 45 Tremont, Westchester Co., N. Y.

WARD'S PATENT



CENTER OR TRANSOM PLATE
FOR RAILWAY CARS,

With Oil Receptacle for Bearing-Ring to work in. They are acknowledged to be the best in use. See description and drawings in CAR-BUILDER for January, 1874.

Address, AMBROSE WARD,
ALTOONA, PA.

ST. CHARLES CAR CO.

This Company is now prepared to furnish on short notice, and at low prices, all kinds of

FREIGHT CARS,

built in the most approved manner and of the best material. Orders respectfully solicited. Address,

ST. CHARLES MFG. CO.,
ST. CHARLES, MO.

REFERENCES.

THOS. ALLEN, Pres't St. Louis, Iron Mountain & Southern R.R.
T. MCKISSOCK, Gen'l Sup't St. Louis, Iron Mountain & S. R.R.
A. W. LOPER, Ass't Sup't St. Louis, Iron Mountain & S. R.R.
WM. HOGE, Pres't St. Louis, Kansas City & Northern R.R.
W. C. VAN HORN, Gen'l Sup't St. Louis, Kansas City & N. R.R.
J. L. HINKLEY, Ass't Sup't St. Louis, Kansas City & N. R.R.

Jas. M. Blanchard. W. R. Singleton.
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BLANCHARD & SINGLETON,
SOLICIT
Foreign and American Patents,
PROSECUTE UNITED STATES LAND CLAIMS,
And Act as Experts in Patent Cases.
OFFICE, 517 SEVENTH ST.,
Opposite P. O., *Washington, D. C.*

TRADE MARK
MACHINE PICKED
Moss
NEW ORLEANS

Trade Mark, Registered May, 1874.

FERGUSON & HABER,

PROPRIETORS AND MANUFACTURERS OF THE

CRESCENT BRAND MOSS,

LOCK BOX 436, P. O.

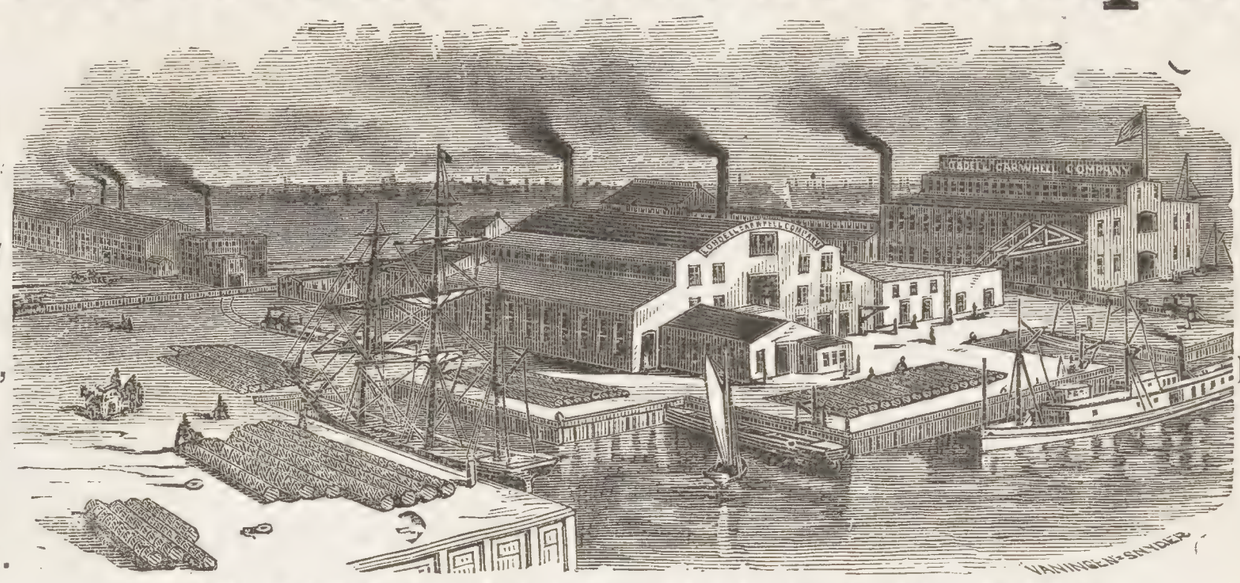
FACTORY—162 FRONT and 160, 162 and 164 DELTA ST., N. O.

OFFICE—57 MAGAZINE STREET.

Having perfected and patented our machinery, we guarantee all Moss put up by us to possess the following qualities—*full length of fibre, freedom from dust, strictness of grade, preservation of elasticity, and exactness of weight*, and used with great success by the leading carriage makers, upholsterers and railroad companies in the United States, as the most economical substitute for curled hair.

Lobdell Car-Wheel Company.

SINGLE AND DOUBLE PLATE AND HOLLOW SPOKE WHEELS, FOR City and STEAM ROADS.



CHILLED ROLLS FOR PAPER, BRASS, COPPER, AND ROLLING MILLS. Castings of all Descriptions.

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RAILWAY CAR VARNISH.

Elastic, pale, and extremely durable, possessing great brilliancy of lustre, and producing a hard, fine **finish,** resisting in the highest degree effects of time and exposure. Should be used over our Rubbing.

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Dries readily, with brilliant lustre; durable under severest exposure in any climate.

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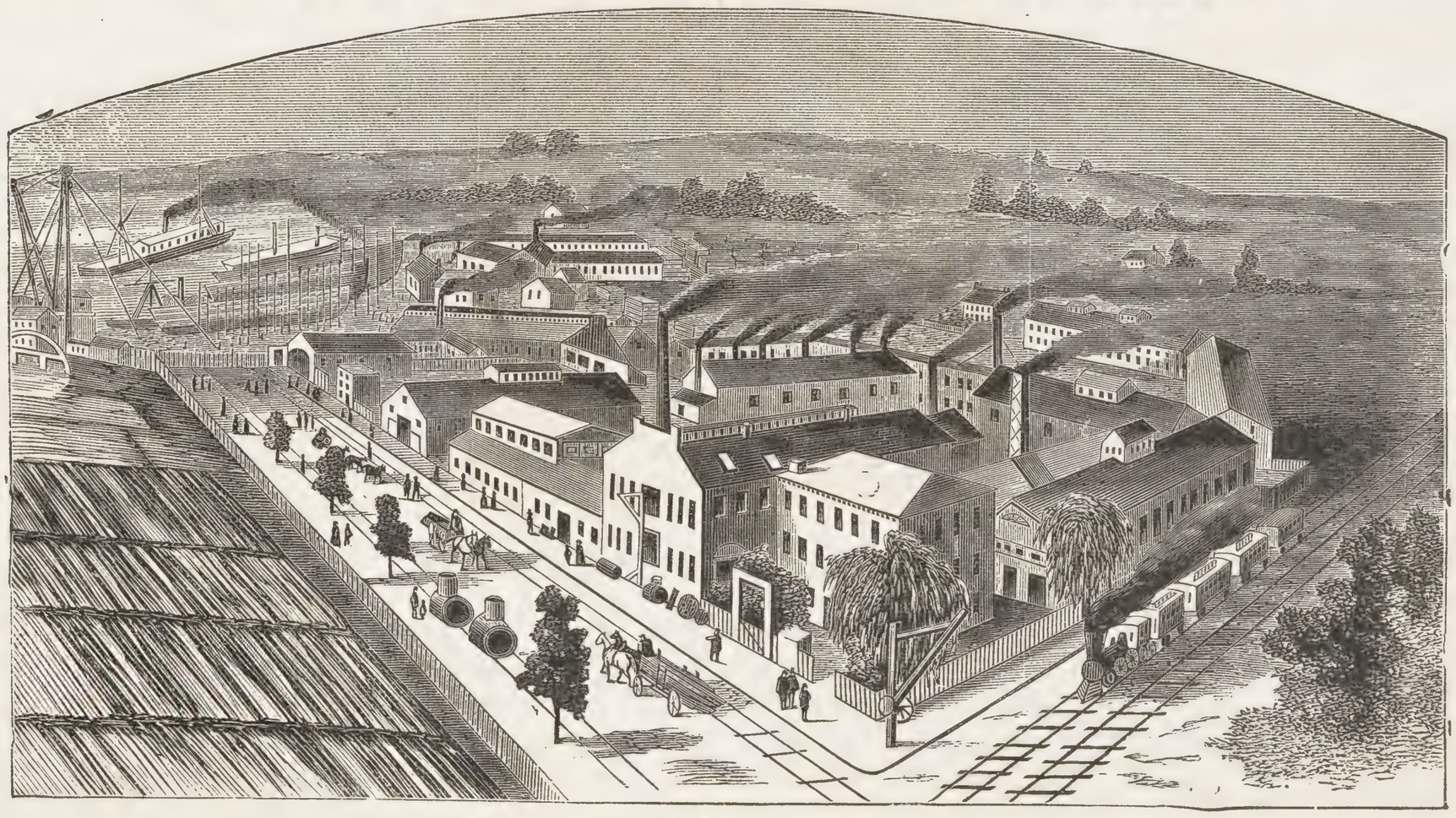
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FIRST and SECOND-CLASS DRAWING-ROOM, SLEEPING, BAGGAGE, MAIL, and EXPRESS, BOX, and FLAT.

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We call attention to the following prices of our Varnishes especially adapted to Railway Uses, and submit that they combine more prominently than any others, the INDISPENSABLE REQUISITES for Railway Consumption. They are of heavy body, light color, quick drying, and are guaranteed to give a maximum of durability.

Wearing Body, (For Outside Finishing.)	**$5 50**
Hard-Drying Body, (For Under Coats on Cars.)	**5 00**
Rubbing Body, (For Under Coats on Cars.)	**4 50**
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No. 1 Black, (For Iron-Work.)	**1 50**

UNIFORM SUPERIORITY IN QUALITY AND FIXED PRICE TO ALL will continue to characterize these goods, and Satisfaction in their use is assured.

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White Lead, Red Lead,

LITHARGE,

ORANGE MINERAL,

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Page 1.

THE DISNEY CAR COUPLER,

Patented June 24th, 1874. Manufactured by

F. E. CANDA & CO.,

CHICAGO, ILL.

Fig. 1.

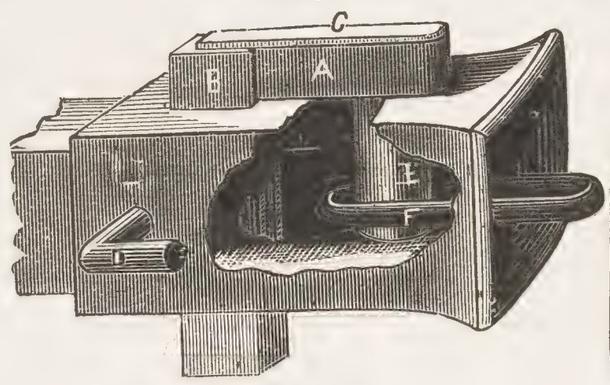


Fig. 2.

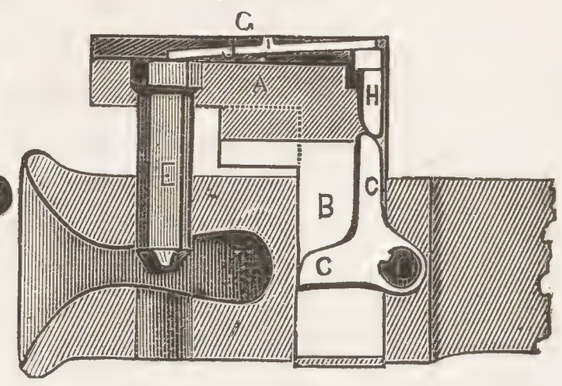


Fig. 1 represents the draw-head with a portion broken away to show the interior.

Fig. 2 represents a vertical, sectional view. *A B* we designate *The Drop*, the upper part *A* serving as the pin-holder. *D* is a lever by which the device is operated, fastened to a shaft passing through the draw-head. *C C* is a forked piece keyed to this shaft. *H* is a small loose pin. *E* is the large pin for securing the link *F*. *J* is a lever resting on the heads of pins *E* and *H*, with its fulcrum on cap-piece *G*. *Then*, when set for coupling or uncoupling, as in Fig. 2, the link *F*, in passing the mouth of the draw-head, raises pin *E*, which by lever *J* forces pin *H* against and displaces the upper arm of *C C*, allowing the *drop* to fall, carrying pin *E* with it.

From the above cuts and description it is apparent that this device combines simplicity in its construction, reliability in its working, and durability in all its parts.

We designate as points of special advantage:

That working from the side of the draw-head, it leaves no opening at the top for dirt, gravel, or accumulations of ice and snow to interfere with the working of the coupler.

That, while the link is always held in a horizontal position for entering, yet it has sufficient vertical movement to accommodate itself to cars of different heights, not exceeding a variation of six inches, without using the crooked link.

That the mouth of the draw-head is of such shape as secures the pin from all liability of bending or breaking.

That it always couples when desired, or set for coupling, and will *never* couple when not desired.

That, working readily from the top and sides of cars, there is no risk of life or limb.

That the pin can never be lost or stolen.

And further, that from its reliability of working, and durability of parts, combined with the device for securing it to passenger cars, makes *This Coupler* the safest and by far the most economical *Passenger Car* Coupler ever introduced.

The Disney Car Coupler, wherever tried or however thoroughly tried, has given the most perfect satisfaction, both as a Freight and Passenger Car Coupler.

For further information, address

H. C. KIBBE, 419 California St., San Francisco, Cal.,

AND

F. E. CANDA & CO., Railroad Contractors and Car Builders,

79 SOUTH CLARK ST., CHICAGO, ILL.

THE
Atlantic White Lead
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LINSEED OIL COMPANY,
Manufacturers of
WHITE LEAD,
DRY AND IN OIL.
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CRUSHERS OF LINSEED OIL.

ATLANTIC WHITE LEAD. PURE. WARRANTED. ROBERT COLGATE & CO.

TRADE-MARK.

Robert Colgate & Co.,

287 Pearl St.,

NEW-YORK.

KATAHDIN CHARCOAL PIG IRON.

O. W. DAVIS, Jr., Manufacturer, BANGOR, MAINE.

SOUTH BOSTON IRON CO.'S TESTS OF KATAHDIN PIG IRON, 1874:

	Density.	Tensile strength per square inch.
No. 2 Pig Iron,	7,2002	18,894
" 3 "	7,2432	26,928
" 4 "	7,2305	30,765

Nos. 1 and 2 are soft and strong, suitable for machinery and fine castings, boiler plates and steel. Nos. 3 and 4 are close-grained and tough, adapted for steam cylinders, radiators, locomotive castings, car-wheels, hydraulic presses, etc. All grades contain less than one-tenth of one per cent of sulphur or phosphorus. Shipped by rail or water from Bangor to any part of the country.

THE NATIONAL CAR BUILDER.

DEVOTED TO THE INTERESTS OF RAILWAY ROLLING STOCK.

Vol. VI. *No. 6.* JUNE, 1875. *$1.10 per Annum. Single Copies, 10 Cents.*

Eighth Annual Convention of the Railway Master Mechanics' Association.

THE eighth annual convention of this association was held at the Cooper Institute, in this city, on the 11th, 12th, and 13th ultimo. On the call of the roll at the opening of the convention, seventy-three members answered to their names, which number was increased by subsequent arrivals.

THE PRESIDENT'S ADDRESS.

MR. H. M. BRITTON, the President of the Association, after calling the convention to order, delivered a lengthy address, congratulating the members on the present reunion and the prosperity and usefulness of the organization. Referring to the general condition of railways throughout the country, and the views previously advanced by him, Mr. Britton said:

"I have not sought to be an alarmist nor a prophet of ill, yet I could not avoid pointing out to you what seemed to me the tendency, from the gross errors and extravagances which have obtained so strong a hold upon our railway economy. The results which you and I then foresaw have followed, and we are in the midst of a widespread railway bankruptcy. I am not about to discuss it. This is not an occasion to be given up to painful subjects; but I should fail in my duty, gentlemen, and you will fail in what the railway interests of the country have a right to expect from you, if we do not attempt to show how the equipment of railways can be so reformed as to aid in restoring this great interest to a solvent condition.

"Gentlemen, this railway bankruptcy has given rise to various expedients for overcoming it. Among other remedies, 'narrow-gauge railways' have been widely recommended, as capable of so much cheaper operation that their adoption would work a cure. I refer to this, not for the purpose of discussing the question of gauge, but to call your attention to the fact that where the narrow gauge has been adopted, the great practical effect has been to materially reduce the weight of rolling stock. Here, it is well to pause for reflection; here, we are touched in our own department of railway economy; here we are affected where we alone are concerned, and where we have the whole responsibility. If a narrow-gauge railway can be operated at materially less expense than one of the ordinary gauge, chiefly because the rolling stock in use upon it is lighter, or, to speak more correctly, because there is less dead weight hauled upon the narrow gauge in proportion to the paying weight than upon the ordinary gauge, is there not a remedy at once to be applied to reduce the cost of doing business on railways of the ordinary gauge by reducing the weight of the rolling stock?

"Gentlemen, during the last twenty years, railways of the ordinary gauge have not changed in their superstructure, in their bridges, nor in their iron; but the rolling stock in use upon them has increased in weight from 50 to 100 per cent, and the usual load for a freight-car has increased 50 per cent. The same bridge and the same iron, and yet an enormous increase in the weight which is constantly bearing down to crush that iron and those bridges. Can any thing be more obvious than that if the proper proportions formerly existed between the superstructure, the iron and the bridges, and the weight of the rolling stock, those proportions are now entirely out of balance?

"If a locomotive that weighed 22 tons and a freight-car that carried 8 tons and a passenger-car that weighed 15 tons were suitable to railways of the ordinary gauge 20 years ago, how is it that without changing the roads we are now operating on them locomotives weighing 33 tons and upward, freight-cars loading 12 tons and upward, and passenger-cars varying from 20 to 35 tons? I believe, gentlemen, that these are essentially the facts of the case; I believe they have had a material influence in producing the present railway bankruptcy; and it seems to me that it does not speak well of our influence as master mechanics that we have not been able to do more with railway managers in preventing the use of rolling stock of such enormous weight.

"At this meeting, and as an association, it is our duty to do all in our power to correct this great evil. We must show that a change of gauge is not what is required, but a change in the weight of the rolling stock. The present gauge—the gauge of Stephenson—will answer for all main lines of railway if the dead weight of rolling stock is not so out of proportion to the paying weight as to be a burden upon the commerce of the country by materially affecting the earnings of the railways.

"Gentlemen, the question is often asked, why we, as an association, do not arrive at definite conclusions. This question should be carefully considered. If we meet each year in convention, hear the reports of the committees, and fully discuss them, I doubt if there is a necessity of any definite action as a convention. We can each judge from the reports and discussions as to what is the best material, and which the best manner of construction

SECRETARY'S REPORT.

Mr. J. H. Setchel, the Secretary, reported that since his last year's report, six members have resigned, and 37 new ones have joined the Association, 30 having joined at the last convention and seven since. The names of 16 members, now two years in arrears for dues, will be dropped hereafter. Excluding these, there are now 222 members and 12 associates.

TREASURER'S REPORT.

The report of S. J. Hayes, Treasurer, shows a balance on hand at the beginning of the year amounting to $298, and an income of $2098, a total on the debit side of $2396. Out of this was paid $500 to the Secretary, $258 for reporting proceedings, $1490 to Wilstach, Baldwin & Co., for printing, and $125 for other expenses, leaving a balance of $23 on hand. There was a balance of $313 due the printers, and $660 due the Association from its members.

THE BEST MATERIAL, CONSTRUCTION AND OPERATION OF BOILERS.

This committee, consisting of James M. Boon, J. A. Jackman, and G. W. Cushing, report that they have data from about 200 boilers with outside sheets and waist of steel; from one of iron with steel throat sheets, and of 200 with outside shell wholly of iron. In all cases, a favorable report is made of the steel boilers, though in some cases the objection is made that the excess of cost of steel over good iron is greater than the advantages obtained by its use. The committee has reports from both steel and iron fire-boxes, but none from parties using copper for that purpose. With wood-burning engines the steel fire-boxes are giving general satisfaction. With engines burning bituminous coal, there are many complaints of cracks in the side sheets after a service of from six months to two or three years. The committee believe that good homogeneous steel that will not harden is the best material for boilers and fire-boxes. While it costs about 20 per cent more, weight for weight, than iron in outside shells, this is offset by the use of thinner sheets.

With wood-burning fire-boxes, steel is giving the best results, as it will not blister, and lighter sheets can be used. The best quality of iron that will not blister will last from eight to twelve years with wood. With bituminous coal, copper fire-boxes are objectionable, as the plates wear away to a dangerous thinness from the mechanical abrasion of the fine coal and cinders, and this wear can only be detected by drilling holes, as the plates wear between the stay-bolts, but are forced into line by the pressure, and present an even surface to the eye. The average life of a copper fire-box is from three to five years.

With steel, the main objection urged is its cracking. The advantages are the greater durability and the use of thinner sheets, presenting less obstacle to the transmission of heat. The committee have records of 41 steel fire-boxes among the first in use; the average duration of the three highest was 9½ years; the three lowest 4⅓ years; and the whole 41, 6⅓ years. The greatest trouble with steel is that the metal as manufactured is not uniform.

The committee report nothing new in construction during the past year. The general practice is to use ⅜-inch iron or steel for outside sheets, 5–16 inch iron or steel for fire-boxes, and from ⅜ to ½ inch for tube sheets. Water spaces around fire-box from 2½ to 3½ inches inside, and from 2¾ to 4 inches in front. At straight seams, 11–16 inch rivets are used, spaced 1¾ inches between centres. Longitudinal seams double riveted, centres of the two lines of rivets 1⅛ inches apart, centre to centre of rivets on the same line, 2¾ inches. Stay-bolts, ⅞-inch diameters, 4 inches centre to centre. The committee believe that thin plates give the best result in fire-boxes, sides and back of ¼-inch steel, crown sheet 5–16 inch steel, and tube-sheet ⅜ inch. Tube sheets of 7–16 inch iron, the other plates being steel, have also given good results. It is believed that ¼-inch steel plates are strong enough for side sheets, and less liable to crack than thicker plates. They are also more easily straightened when sagged down from mud collecting on it, and will not crack so quickly from overheated crown-bar bolts. The committee also believe that on coal-burners the water spaces around fire-box should never be less than 3 inches, and 3½ is better. In old engines changed from wood to coal-burners, with 2½ and 2¾ inch water spaces, many fire-boxes are destroyed by burning of the sheets, owing to the water being driven out of the narrow spaces by intense heat. Many good results have been obtained by narrowing the fire-box from bottom to top, giving increased water-space.

Larger sheets are being generally used, giving good satisfaction. It is a general opinion that no advantage has been gained by using large smoke-boxes. In this, the committee concur, as they have found that with a large smoke-box the nozzles have to be contracted to an injurious extent to procure the necessary draft.

With a good boiler, 120 pounds is considered a safe working pressure; on some roads, 130 pounds is the maximum allowed.

With regard to braces from frame to boiler, it is a very common practice to rivet angle iron to the bottom of the boiler and connect it by a ½-inch iron plate to the guide-yoke (or a plain iron brace) carried across from frame to frame. It is also common to rivet braces to the boiler, the heel under the waist. The committee condemn both these plans, as corrosion is sure to take place about the rivet-heads and the expansion and contraction will break the sheet. All braces from frame to boiler should be fastened to the boiler at the centre line and the brace made light, so that the expansion will spring it and not affect the sheets. The committee believe that in most engines one brace a side is ample.

The life of a boiler depends upon quality of material, purity of water used, design of boiler, pressure

carried, and care taken of it while in service. Deterioration begins as soon as a boiler goes into service and continues with more or less rapidity. One of the committee has in less than seven years broken up 54 boilers, all of iron, some of them of the very best Pennsylvania charcoal iron, yet after 20 years' service, this would break like poor cast-iron, showing a fine white grain. The first defects to show are generally at bottom of waist; at seam of front tube-sheet the iron will be corroded; where a brace is riveted to bottom of boiler, defects will show around rivet-heads. Sometimes the sheets are pitted or corroded in spots from ¼ to 3 inches diameter. These defects show in from three to five years and increase with age. Boilers have been condemned for corroding in seven years. The committee believe that 12 years is as long as is profitable to use a boiler, and, where bad water is used, 10 years is enough. It may be claimed that boilers will run 20 years and over, but the fact that they have done so does not prove them to be safe.

Tubes should be removed for examining the boiler at least once in three years, with bad water more frequently, sometimes every year. The only sure way to know the condition of a boiler is to take out the tubes, remove all scale and inspect carefully. There is no safety in testing with pressure, as a boiler may stand the test and yet be defective. An instance is known to the committee where a boiler stood a hydraulic test of 150 pounds to the square inch, and yet exploded three months afterward with 110 pounds pressure.

The above is a very full summary of the report, and embraces all its material points.

A lengthy discussion followed, of which we can only give the general tenor

Mr. R. O. Carscadin (Chicago, Rock Island, and Pacific) said that he had 18 engines with steel boilers, in active use for four years, and had found but one crack, and that was in the crown-sheet outside, close to a double row of rivets, and parallel to the centre of the boiler. He was not quite prepared to recommend the use of steel boilers, but merely stated his experience. The 18 engines had run from 25,000 to 30,000 miles per month, and he had never had to patch but the one.

Mr. Howard Fry (Phila. & Erie) said the report of the committee would lead members to suppose that steel was a very unreliable material. It was important to ascertain whether there was any special liability in steel to crack further than what was caused by defective sheets; also, how it is treated by those who used it successfully. In England, many boilers were being built of steel, while they were afraid of using it for fire-boxes. In this country, however, the practice was quite the reverse.

Mr. H. G. Brooks (Brooks Locomotive Works) thought it would be unsafe to use steel unless the plates were thoroughly annealed after flanging and before riveting, so as to allow the strains caused by flanging to assert themselves, as these were the chief causes of cracking. Every manipulation of a sheet of metal tended to strain it; a single blow would be felt, and if the sheet is confined at any point it can not relieve itself except upon the point of rigid termination. All strains thrown upon the boiler, whether from the motion or working of the engine, or from changes of temperature within itself, must be relieved in some way within the structure of the boiler, which is the basic element of the whole structure.

Mr. J. M. Boon (Pitts., Ft. Wayne, and Chicago) did not believe that annealing would prevent cracking. The side-sheets were most liable to crack, and they were not flanged at all, while the fire-door sheet, which had the most flanging, rarely cracked if the boiler was kept clean.

Mr. James Sedgley (L. Shore and Mich. Southern) had had much trouble with side-sheets, and he believed it was because they were not properly annealed. Where iron boilers failed in three years, and required patching, he had been running steel boilers six or seven years without any apparent depreciation. He had no trouble with the outsides of boilers where steel was used, but the fire-boxes cracked more or less in the side-sheets diagonally, commencing forward of the arch and running back. He thought annealing would not change the nature of steel, but that it would relapse into its normal condition by use.

Mr. Brooks said there was a distinction between annealing these sheets and the ordinary process of annealing. The object was not simply to soften the sheet, but to allow the strains to which it was subjected to distribute themselves.

Mr. W. H. Hudson (Rogers Locomotive Works) said the punching and hammering of unflanged sheets tended to lengthen the outside edges and put a strain on the centre. Annealing restored the sheet and made the tension more uniform. The accumulation of mud varied the temperature as it affected the sheet, and strains were produced in that way. He had seen mud in boilers a foot deep.

Mr. Perrin (Taunton Locomotive Works) thought the thickness of sheets had something to do with their tendency to crack. We were apt to use too thick iron and steel for boilers. He favored ¼ inch in preference to $\frac{5}{16}$. Thinner steel gives more uniform expansion, especially where it is covered with mud on one side. He had had very good success in annealing steel after flanging.

Mr. Sedgley, referring to sundry engines built for his road by the Brooks Locomotive Works, said that none of the fire-boxes of freight-engines had cracked. The trouble was with heavy passenger-engines that were forced to do their utmost, and carrying 140 pounds pressure. They were now carrying this amount of pressure on steel boilers three and four years old, with no signs of depreciation.

Mr. J. H. Setchel (Little Miami) referred to the former reports and discussions of the association on this subject, as showing much difference of opinion as to the use of steel in different localities. On his road they had two engines with iron fire-boxes that had been in service since 1860 and are in service still, the fire-boxes in good condition, with no fractures. For seven years of their life these engines have been burning coal. He had another engine with iron fire-box that had run seven years, half the time with coal, with hard service and hard water. Then he had engines with steel fire-boxes, burning coal, that had run seven or eight years and were still in good condition. These had burned wood for the first two years, and in cases where this was done he had had no trouble with cracks, either with steel or iron fire-boxes. From his own experience he would be at a loss whether to choose iron or steel. He believed in steel, but wanted to hear the experience of others to determine whether he was justified in using it.

Mr. Coleman Sellers, of Philadelphia, said he had heard very little about the quality of the steel used. Steel differs very much in quality. He might say that there were three types of steel: The earliest form is that made in crucibles; then there was the Bessemer steel, and the third form is that made by the open-hearth process. The process used in making the last is that likely to produce the most uniform and satisfactory metal for boiler-sheets, because in that definite quantities of materials are used that have been carefully analyzed and found to contain certain ingredients that are known to be the ingredients of the best form of steel. He thought the form of the boiler had much to do with the tendency to crack. He had asked whether iron sheets submitted to the same strain in the boiler, and put in the same places, did not break; the answer was that they do. It may be therefore the form of the boiler, rather than the material, that causes the cracks. In regard to the thinness of the sheets, he said thin steel had proved a failure in the construction of steamships, but in locomotive boilers, the rivet-holes and the strain the sheets were subjected to must be considered.

Mr. Hudson referred to the fire-box of an engine on the Pennsylvania Railroad that had been built at his works twenty years ago, of Low Moor iron, and which was still in use and in very good condition. In regard to steel, he would like to know how to get the right quality. He was now making boilers entirely of steel, the plates having been tested and stamped. The tests were confined to a tensile strain of 65,000 or 70,000 pounds. The material was found to work remarkably well, and he believed it would make a very desirable boiler; but that remained to be seen.

Mr. Brooks moved that each master mechanic present be requested during the next year, if any cracks occur in the fire-box, to secure a piece of the sheet as a sample of the steel, and carefully mark upon it the data that may be of use, such as service of engine, fuel used, time in use, etc., and that these samples be brought to the next convention to be submitted to a special committee to be tested.

The motion was agreed to.

The discussion was continued at great length, and until the hour of recess, a number of members giving their views and experience in the matter of fire-boxes, but without reaching any definite conclusions.

PURIFICATION OF FEED-WATER.

The committee on this subject reported that in regard to experiments made within the last two or three years, no information had reached them as to results. Reports had been made to the committee setting forth the advantages of changing water stations where the supply was from wells or springs of hard water, to other places where it could be procured from streams and collections of surface-water. There was much less trouble from incrustation in cases where the latter was used.

Though excellent results may be had by collecting surface-water in ponds or reservoirs, means should be provided for settling or filtering the mud in such water. Prof. J. N. Sewall, of the Illinois University, has decided that the most effective substance for treating such water is ammoniated pinate of soda, which will precipitate all the salts of lime, magnesia, iron and alumina, at an expense estimated at one cent per hundred gallons, or half a cent per mile run, while the addition to the cost caused by incrustation is estimated at two and a half cents per mile. The only addition to apparatus needed in using this is an extra tub for every tank, so that water may be drawn from one while being treated in the other. The water would need to be first analyzed, and the precipitating substance then composed to suit its peculiar qualities. It can be applied by ordinary workmen without failure. On the Northern Pacific Railroad, under the direction of the chairman of the committee, 60,000 gallons were treated by this process with quite satisfactory results. None of the chemicals offered in the market for preventing or removing scale are recommended by any members of the Association in their answers to the committee's circulars. The committee describe the method of using carbonate of soda for removing scale; they have received flattering accounts of the efficiency of steatite talc, and they purpose to make further trial of it. The condensing apparatus mentioned in last year's report is still used successfully on the Hannibal and St. Joseph road. The more general use of the mud drum is recommended; the mud-valve should be blown off several times a day. But the chief dependence for locomotive boilers must be the securing of soft water from the natural surface or the purification of the hard water, if it must be used, before it enters the boiler.

A long and very interesting letter from Mr. H. V. Faries, master mechanic of the Atchison, Topeka and Santa Fé Railroad, and also a paper by Prof. Sewall, were submitted with the report.

LOCOMOTIVE CONSTRUCTION.

The committee on this subject, consisting of Messrs. J. Sedgley, L. S. Young, and Howard Fry, reported that, in answer to circulars, no replies have been received which point to any improvements in the construction of boilers tending to increased economy in fuel. One of the committee has tested a device for increasing heating surface by inserting a number of cast-iron hollow globes secured by a neck into the crown-sheet. While no accurate experiments have been made, it is evident that some saving has been effected, and there has been no trouble from leaky joints or mud settling in the globe-necks. A similar device is in use on marine boilers. No replies have been received concerning the Weston boiler; and while some tests have been in progress, no details have been received. Replies received from members using the Jauriet fire-box do not enable the committee to draw any accurate comparison between it and the ordinary fire-box with brick arch.

The use of balanced valves appears to be extending but no definite advance is reported. The committee believe that cheapness of construction may be promoted without incurring risk of breakage and with good results as to wear, by using cast-iron for links.

The committee have received no information leading them to believe that any satisfactory improvement has been made in spark-arresters. One of the members, on a recent visit to England, was forcibly impressed with the fact that no trouble is there found from the throwing of fire, and was led to believe that it is worth a careful experiment to decide whether the arrangement of nozzle and stack there used would give good results in this country.

The committee visited one road where a Fairlie double-truck engine, as modified by William Mason, has been in use twelve months with excellent results. It is believed to be too soon, however, to pronounce any opinion on this pattern of engine, especially in view of the heavy strains thrown upon the boiler. If a powerful engine is needed, those of the consolidation pattern are believed to answer every purpose.

TRAIN SIGNALS.

The committee reported that many roads continued to use the bell-cord, flags of various colors, and lanterns, as the best system of signals. Hall's automatic electric-signals and Wyeth's speed-indicator are recommended as valuable appliances. In train head-signals, the only new thing reported is a system introduced by Mr. Robinson, on the Great Western, of indicating the number of each train, by changeable metallic figures placed in front of the head-light. At night, red and green oil-silk screens, placed inside of the head-light and in front of the reflectors, and fixed on rollers, so as to be worked instantaneously from the cab, are used, and have been found of great service.

LOCOMOTIVE AND TENDER WHEELS.

This committee, which consists of Messrs. J. N. Lauder, G. W. Stratton, and S. A. Hodgman, report that, in answer to the circulars sent out, replies have been received from fifteen different roads. There were reported fifty-seven broken tires on different roads. One instance is reported where a steel tire of good thickness was seen to break from a direct blow, the en-

gineer having slackened speed on account of a very bad joint he had observed in the track, he at the same time watching the wheel closely.

From information and experience, the committee believe that at the South, steel tires of good quality can be run until they are worn down to 11-16 inches in thickness. Where intensely cold weather is experienced, 1⅛ inches is a better limit of safety.

Replies to circulars are almost unanimously in favor of shrinkage alone as a method of securing the tire to the wheel-centre, allowing 1-100 of an inch to each foot of diameter.

In regard to truck and tender wheels, the data obtained are very meagre and unsatisfactory. Mr. Sedgley, of the Lake Shore and Michigan Southern, submits a very complete statement of the performance of engine-truck, tender, and passenger-car wheels on that road, which is appended to the report.

From the Terre-Haute and Indianapolis road, reports are given of ninety-four pairs of 30-inch tender-wheels, with an average mileage of 32,435 miles, and thirty-one pairs of engine-truck wheels, with an average life of 46,176 miles. The mileage varied from 60,475 to 13,101 miles. Mr. Weaver, of the Eastern Kentucky, has been experimenting with a mixture of hot-blast charcoal, iron, and steel. They are reported as chilling deeper than the ordinary wheel, and have thus far given good results as compared with the ordinary wheel, but have not been in use long enough for a full trial. On the Boston and Providence road, Mr. Richards reports two pairs of solid Bochum cast-steel truck-wheels in use two years, with scarcely any perceptible wear. The Washburn steel-tired wheels are also reported as giving good results. On the Toledo, Wabash, and Western, Mr. Johann reports about 1000 engine, truck, and tender wheels, giving an average mileage of about 40,000 miles. Mr. Finlay, of the Cairo and Fulton, reports that two hundred wheels from a well-known foundry gave an average run of 40,000 miles, while one hundred and sixty-eight from another maker averaged 12,000 miles only. Mr. Lauder, of the Northern (N. H.) Railroad reports that of sixty-eight steel-tired engine-truck wheels (26 and 28 inches diameter), eight have failed after running 30,000 to 40,000 miles, while others are in good condition after two and a half years' service. A table giving mileage of these wheels is appended to the report. These wheels are made by heating the tire to a bright red, putting it in the mould, and then running molten cast-iron through until the tire is brought to a welding heat. The flow of iron is then stopped and the mould allowed to fill.

CONTINUOUS TRAIN-BRAKES.

This committee, which consists of Messrs. Charles R. Peddle, George Richards, and F. Gould, reports that only nine replies, nearly all brief, were received to the circulars. On all the roads reporting, the Westinghouse air-brake was in use. The cost of repairs per engine per year is reported by five roads, and varied from $17.40 to $87. Only two roads report the cost per car per year, the amounts being $4.35 and $4.65 respectively. One accident is reported resulting from the breaking of a hose and the consequent failure of the brakes to work. A number of instances are recorded where serious accidents were prevented by the use of the brake. With regard to the automatic improvement of the Westinghouse brake, the replies indicate a difference of opinion, some master-mechanics considering its use essential, while others believe that the advantages gained are not sufficient to counterbalance the increased complexity, and therefore prefer the original and simpler form of the brake.

It is generally considered that where the air-cylinders are regularly cleaned and lubricated, and the brake properly handled, there is no trouble in starting up a train after using it. Crude petroleum is recommended as a lubricant for the piston-leathers. One member of the committee experimented with a release-valve attached to the car-cylinders, which permitted a sudden exhaust of the air from them, but the results were not satisfactory, there being a disagreeable concussion of the cars and too great loss of air, where the brake was used often.

As to durability of car-wheels, the committee do not believe that it is any greater with power than with hand-brakes, but this is a difficult question to decide. Two roads reported the application of air-brakes to the driving-wheels of engines, but no special experiments have been made as to their efficiency.

The committee, while admitting the advantages of the Westinghouse brake, believe that the air-brake of the future must combine those advantages with a simpler and cheaper compressing apparatus, but in what way that can be attained is a problem yet to be solved.

Reference is made to the Henderson hydraulic brake, recently tested on the Westchester and Philadelphia road, and to the McBride hydraulic brake, which is similar in principle to Henderson's, but differing in details, McBride having adopted the Westinghouse car-fixtures complete. The committee is of opinion that a fluid-like water, having less elasticity than air and a slower movement, can not be so desirable as a means of transmitting power to a brake. Much stress is laid by inventors of brakes on their ability to make short stops, but these are too frequently accompanied with that sudden and disagreeable concussion which the air-brake avoids.

The report contains a careful calculation of the retarding power exerted by a good continuous brake in stopping a train, say of engine and six cars, weighing one hundred and seventy tons in all, at a speed of forty miles per hour on a straight track, and suggests the comparison of the theoretical results with those ascertained by actual experiment.

The committee regret that no reports were received from roads using the Smith vacuum brake, as a comparison of results with the air-brake would have been instructive. The Westinghouse air-brake is now in use on over one hundred roads, the Smith vacuum brake on thirteen, and the Loughbridge air-brake on two.

Mr. Woodcock said that his road had used the vacuum brake since July, 1872, and it had given entire satisfaction. They liked it for its simplicity, effectiveness, and the small cost of repairs. The latter expense with them was $4.22 per car per year, and $9.55 per engine.

Mr. Hollister (Philadelphia and Reading) said that he had had the vacuum brake on 6 engines and 20 cars for a year. There was no expense, except occasionally to replace a hose that had been broken off.

Mr. Graham (Lackawanna and Bloomsburg) said that they had put the vacuum brake last fall on 6 engines and 100 cars, and had had no expense, except to replace a hose that was pulled apart by reason of the neglect of the brakeman to uncouple it when a car was detached.

Mr. Setchel thought that this subject was only second in importance to boilers. On his road they thought they could not do without a continuous brake. They had the Westinghouse on 23 engines and 60 cars, and he had been surprised to see how light the expense was. He had kept an accurate account, and had given the result to the committee. He thought, however, that the air-pump might be made more simple and cheaper. He could not see why the Westinghouse people stuck to this pump, unless it was to justify the high price they asked for the brake. He thought it would be better to have a pump worked by the engine when in motion. The objection was made that this would make it necessary to have air always stored up in the reservoir, but that could easily be managed by a stop-cock. With a tight reservoir, pressure could be kept up all the time. By this arrangement, the expense for the pumps would be only one tenth of what it is now. The Loughridge air-brake on the Baltimore and Ohio costs nothing, except for oil. He thought they should favor something cheaper than the Westinghouse.

Mr. Lannan (Western Maryland) said they had used the Loughridge brake since February last on 3 engines and 2 trains. They had no difficulty in holding 75 or 80 pounds pressure in the reservoir, even over-night. They put the stop-cock as close to the reservoir as possible, and in the morning, when they ran out and opened the cock, they found that they had not lost usually over 3 pounds pressure. The pump and reservoir cost about $80. The reservoir held about 13 cubic feet. This brake gave them less trouble than the hand-brake. It needed no other springs to throw off the brakes than those already in use for the hand-brakes. They had no trouble in starting a train on their heaviest grades, and they had one of 95 feet to the mile.

Mr. Robinson asked whether any members were using air-brakes on freight-trains, and, if so, whether they had much trouble with the air-pipes. On the Great Western they were much pleased with the Westinghouse brake. But they hauled many foreign cars, and they frequently had to connect under these with temporary rubber pipes, and take them off again at the end of the run of 230 miles. These pipes were expensive, because they frequently broke, but that was not fairly to be charged to the air-brake.

LUBRICANTS FOR LOCOMOTIVES.

The committee on this subject report that the economical result of any lubricant in practice depends on many things besides its own intrinsic merits, such as weight of engines, character of water, fuel, ballast, dust, state of track, grades, condition of machinery, and, above all, the care exercised by those in charge of lubrication. Questions asking for the results of experience under these varying conditions were sent to members of the Association, 20 of whom returned replies.

From these replies a table was compiled, and the general verdict is in favor of pure tallow, and of lard-oil when pure tallow can not be had.

Twelve of those answering the Committee's circular feed by cab tube in preference to automatic cups; five prefer the Dreyfus cup, which acts by displacement. The highest duties are given by the cab tubes, and they occur on level roads where no long distances are run without steam. Mr. Wells, of the Jeffersonville, Madison and Indianapolis, reports that the automatic cups use more lubricant, but that they enable the valves to be run longer without refacing, and says that too great economy in lubrication is not best for the machinery.

For guides and journals, petroleum seems to be generally adopted, either alone or mixed with lard, fish, or tallow oil. It is generally admitted that good sperm or lard-oil would be a more perfect lubricant, but the cheapness of petroleum and the ease with which other oils can be tempered with it causes it to be used. The West-Virginia "natural oil" is most frequently named as excelling for lubrication. Self-feeding cups are the rule and give the highest duty. Many prefer decidedly the Dreyfus rotary spindle-cup.

The Central of New-Jersey, of standard gauge, used a manufactured oil, doubtless some mixture of petroleum; and the Delaware, Lackawanna & Western, of 6-feet gauge, tallow for cylinders and valves, and petroleum alone for guides and journals; the results were the same for both—27 miles per quart for total lubrication. The roads are similar except in gauge.

The table shows for total lubrication that the lowest mileage per quart of lubricator was on roads with long grades on which engines run considerable distances without steam, and where there is much dust, or fine sand, or grit from fuel or ballast. Dust seems to have more effect than grades, the lowest duty, 22 miles per quart, being on the Philadelphia, Wilmington & Baltimore; the next, 27 miles, on the Central of New-Jersey, and Delaware, Lackawanna & Western. The highest duties are on level lines. After the table was made up, Mr. Wells, of the Jeffersonville, Madison & Indianapolis, reported the greatest mileage per quart, which was for March, 1875, the average of five passenger-engines being 124 miles per quart of tallow for cylinders and valves, and 76 miles per quart of West-Virginia natural oil for guides and journals—an average of 50 miles run per quart for total lubrication of passenger-engines. For the same time eight engines used a quart of tallow per 87 miles on cylinders and valves, and a quart of West-Virginia oil per 62 miles on guides and journals—37½ miles per quart for total lubrication.

Mr. Rushton, of the Atlanta & West-Point, has tried the Brosius system on car-trucks—a wooden saddle covered with cotton web held up by springs against the under side of the journal in the oil-cellar of the journal-box. He reports the result as 1125 miles run per quart of West-Virginia oil mixed with lard-oil and tallow. Mr. Graham, of the Lackawanna & Bloomsburg, had tried a tank-box packed with plumbago and oil. At the time of his report it had made 8090 miles in three months without repacking. Mr. Haughlin, of the Texas & Pacific, had tried a compound called "polar grease," and in car-journal boxes 2600 miles had been run per quart.

STANDARD CAR AND TENDER AXLES.

The committee on this subject, consisting of Messrs. M. N. Forney, Coleman Sellers, and Gordon H. Nott, submitted a lengthy report, stating that twenty-six replies had been received to the circulars sent out, the general tenor of which was favorable to large journals. The substance of these replies is embodied in the report. The committee urge the importance of a uniform size for axles, and after this is determined, it will be easy to adopt a standard for other parts. The committee decline to consider the question of friction, regarding it as too well settled to need any further elucidation, but proceed to discuss the questions of lubrication, increased leverage, resistance and weight in relation to larger journals, as follows:

It is very well known that with excessive pressures per square inch of area, lubricants are pressed out from between the surfaces of a journal and its bearing, and then instead of being entirely separated by a filament of oil, as they should be when perfectly lubricated, they come in contact with each other, and instead of floating as it were on the lubricant, as they should if perfectly lubricated, the metal of the bearing comes in contact with that of the journal, and lubrication is then either very imperfect or may be entirely destroyed and abrasion of the surfaces occurs. It has been found by experiment that the co-efficient of friction with perfectly oiled journals is only about one sixth that of journals very imperfectly lubricated. Of course, between perfect lubrication and that which is very imperfect there is every degree of frictional resistance. The amount of pressure per square inch of area of journal-bearing which will admit of perfect lubrication varies of course with the attending circumstances. Thus, a journal running at high speeds is more difficult to keep well lubricated than

one with the same load on it running more slowly. Some kinds of grease and oil are retained between bearings better than others. The same is true of metals. Brass and various other compounds retain the lubricant on their surface better than most pure metals. Very much also depends upon the attention given to journals and the appliances used for feeding the oil to them. Thus the bearings of the main connecting rod of a locomotive have at times a pressure of from two thousand to three thousand pounds per square inch, whereas the pressure on the journals of cars rarely exceeds one-tenth of that. In order to keep the crank-pins lubricated, it is necessary to give them the most constant and intelligent attention, to use the best lubricants and the most approved means of applying them. The pressure per square inch which can safely be put on a journal must therefore be determined by the attending circumstances. In the case of cars, these are so complicated, that only experience can work out the problem satisfactorily. In the consideration of this question, your committee have not undertaken to lay down any absolute theoretical rules to be universally applied, but they wish simply to recommend a size of axle which in their judgment would be best suited for all the varying circumstances of railroad traffic. In deciding on such a standard, it must be remembered that we must adopt such dimensions as will give good results, under all conditions, and not only under favorable circumstances—that is when loaded with moderate loads, when provided with bearings made of good material, and lubricated with good oil, and carefully and faithfully attended to, when attention is necessary. With the present system of interchanging cars, the problem seems one of providing a standard axle which will work well under the *most unfavorable conditions*. The standard axle should be such as would be the least liable to heat or break when overloaded, when the bearings and oil are of poor material, and the attention such as the most careless, ignorant, and indolent inspector is sure not to give to them. Now, if these are the conditions which must be fulfilled, a large journal is certain to do it very much better than a small one. By increasing the size of the journal the pressure per square inch with any given load is also diminished, and consequently with any given quality of brass or oil there is more certainty of having good lubrication and less liability that the oil will be squeezed out from between the bearings.

It is of course true that by increasing the diameter of the journal the leverage of the wheel on the journal is diminished, and therefore more power is required to overcome the friction than would be needed if the journal were of small diameter. Now, undoubtedly, if it were possible to increase the surface of the journal, by extending its length without enlarging the diameter, it would be better than to increase the diameter. But it is impossible to do this and retain the requisite strength and stiffness, which an axle should have for safety, and to wear evenly when the axle is of iron. Probably the substitution of steel for iron may enable the smaller journal to be extended in length, and yet be of sufficient strength. It is probably true that cars provided with axles, having journals smaller than these recommended for the stand ard, will require somewhat less power to draw them with moderate loads, if they are both thoroughly well lubricated. What is claimed for the large journal is that it is more certain to remain well lubricated in ordinary practice, with the excessive weights with which cars are sure to be loaded at times, and when oiled with poor oil, and with the attention they receive on the long through lines. The advantage possessed by a large journal in this respect it is believed will much more than counterbalance the disadvantage of "increased leverage."

The increased resistance from the latter cause can be shown by a simple calculation. The resistance of a car, as nearly as it is known, is about 6.1 lbs. per ton of 2000 lbs., at a speed of five miles per hour. Assuming that its weight is 20 such tons, the total resistance will be 122 lbs. This is made up of rolling friction of the wheels on the track, and of the friction of the journals. Now, if we take the coefficient of friction of the latter at 0.025, and deduct the weight of the wheels and axles, or 3000 lbs., which does not rest on the journals, from that of the car, we find that the friction of the latter will be equal to 925 lbs.; which divided by the diameter of the wheels, 33 in., and multiplied by that of the journal, 3¼ in., will give the resistance at the tread of the wheel due to journal friction. By making the same calculation for 3¾ in. journals, we find that the resistance due to the small journals is 91, and for the large ones 105 lbs., or a difference of 14 lbs., or an increase of about 11½ per cent. of the total resistance. But it must be remembered that the journal-friction is uniform, or very nearly so, at all speeds, whereas the resistance to rolling, of the atmosphere, and the flange friction, increase very rapidly with the speed. These have been calculated from a table of resistance, recently published, and are given in tabular form herewith. It will be seen that at a speed of 30 miles per hour the resistance is increased 6¼ per cent. by the large journal; at 40 miles per hour 4½ per cent. The same thing will be true of the resistance on grades and curves. Thus, on a grade of 30 feet per mile, and at a speed of 30 miles per hour, the resistance of the car would be increased only about 3 per cent. by the large journal, and at the same speed on a grade of 40 feet per mile 2½ per cent.

Speed in miles per hour.	Total resistance of car weighing 20 tons of 2000 lbs.	Resistance due to journal friction, with 3¼ journal.	Resistance due to journal friction with 3¾ journal.	Percentage of increase of resistance due to large journals.
5	122 lbs.	91 lbs.	105 lbs.	11½
10	132 "	"	"	10½
15	146 "	"	"	9½
20	166 "	"	"	8½
25	192 "	"	"	7¼
30	224 "	"	"	6¼
35	262 "	"	"	5½
40	306 "	"	"	4½
45	356 "	"	"	4
50	412 "	"	"	3½
60	540 "	"	"	2¾

In these calculations, we have assumed that the journals in each case were in a perfect condition of lubrication. If it is remembered that the friction of two surfaces which are only partly or very imperfectly lubricated, is often from four to six times as great as it is when perfectly lubricated, it will be seen that a very slight difference in the condition of the journals and their bearings may increase the resistance very much more than that due to the enlargement of the journal. In other words, enlarging the journal increases the resistance of cars at ordinary speed, of say 20 to 30 miles per hour, from 8½ to 6¼ per cent., whereas, with imperfect lubrication, the friction of the journals may be increased 600 per cent. The importance, therefore, of securing good lubrication is obvious. That this is more certain with the use of large journals is shown by the unanimous testimony of those who replied to the circular of your committee, and who had observed the effects of wear on the bearings of large and small journals. They are unanimous in the opinion that the bearings of the former wear better than those of smaller size.

Very great objection is, however, made to the adoption of a standard axle of the size recommended, owing to its great weight, which is about 335 lbs. finished. To this objection, it is thought that the greater safety to life and limb which would result from its use would alone be a sufficient answer. The attention of those who say "that we never have any broken axles," is called to the report of such breakages contained in the twenty-six replies to the committee's circular. It should be stated that with reference to this point, the recollection of some of those who replied to the committee's inquiry seemed to be as unreliable as that of some of the witnesses in the Beecher trial. It would nevertheless be an instructive practice in single rule of three, to calculate the following "sum." If 26 master-mechanics report 62 broken axles, how many could the 230 master-mechanics given in the printed list before us? A printed list of train accidents in 1874, which doubtless most of you have seen, records 20 accidents from broken axles, and at least one member of your committee knows how imperfect that report is. To say, then, that no accidents do occur from broken axles, is to ignore well-established facts.

An additional reason for selecting the standard recommended by the Master Car Builders' Association, and by your committee, is the fact that it has already been adopted by a number of roads, and large numbers of those axles are now in use. The committee are unable to give a correct list of those roads which have put it in use, but are informed that the New-York Central and Hudson River, the Boston and Albany, the Boston and Providence, and the Delaware, Lackawanna and Western, are using it. It will, of course, insure its general adoption very much earlier should it be recommended by your association; whereas, if the two associations, which in this respect, if in any, should act harmoniously, should disagree, the time when uniformity of rolling stock can be secured will be indefinitely postponed.

Your committee therefore recommend the adoption of the following resolution:

Resolved, That this Association concur with the Master Car Builders' Association in recommending the adoption of the standard for car and tender axles which that Association has proposed, when said axles are to be made of iron.

Mr. Howard Fry wished, before the question was put, to report some experiments made the previous week, at Springfield, Mass., intended to throw some light on the subject, but which were not very successful. Messrs. Adams and Chamberlain, of the Boston and Albany, fitted up a number of cars with large and a number with small axles. Those with small axles were old cars, but with new axles and bearings; the wheels were old. Those with large axles were new throughout. One with large axles was put empty on an incline, and permitted to run by gravity as far as it would. It ran from its starting-point to the middle of the bridge over the Connecticut, the grade being 70 feet per mile. Then a car with small axles was started from the same point. It would have run into the other car, if the brakes had not been applied. Then a car with small journals, loaded with 20 tons, was started. It ran across the bridge, and upon a curve on the other side, a distance of 7897 feet. The car with the large journals with the same load stopped 540 feet short of the other, making a difference of about 7 per cent in favor of the loaded car with small journals. The experiment was repeated with the empty car with small journals, and it ran farther than the loaded one, about 1155 feet, or 15 per cent farther. They intend to repeat the experiments elsewhere. He thought the experiments unsatisfactory, because the cars were all new, having run only from Boston to Springfield. If they had been in service some time, he believed the large journals would have been better lubricated. The new wheels probably did not run as easily as old ones. Then, in the cars with large journals, the axles in the trucks were spread 17 inches wider than the others, which caused more resistance to them on the curve beyond the bridge. Even with this, the difference was but 7 per cent, and less for the loaded than the empty cars. The experiment did not lessen his faith in big axles.

Mr. Sellers said that, though he agreed to the submission of the resolution, he did not think the matter would be ended if it was voted down. There were many things to be considered in determining the dimensions of a standard axle. He approved the size of journal recommended, but was not sure that he would recommend the proposed standard axle in all respects. It was well to proceed slowly in making such radical changes. There may be further light as to the proper form of axle and the proper distance of the journals from the wheels. He preferred that the resolution should be only with regard to the size of journal. There was a fair chance that cheaper steel would be produced; and if it came into use for axles, possibly the size of journal used with iron axles might be preserved and greater strength secured. It seemed to him that it would be wise to keep the question open a little longer.

Mr. Hayes (Illinois Central) was pretty well satisfied that there must be a mistake as to the weight. On their road the axle used had a journal 3¾ by 6 in., 4½ in. diameter of wheel-seat, and 4 in. diameter in centre. Its average weight is 343 lbs. in the rough. He thought a vote in favor of adopting this axle would almost seem to make its adoption obligatory on the roads which they represent. He should not be willing to do that, because they now had axles known to be safe and good under their 5000 cars and their tenders. He might agree with the Committee upon a standard axle, but would not vote that his road should throw away all the axles they now have and adopt that standard. It would be expensive, and the companies would not be willing to incur the expense. Their axle seldom if ever breaks. To his recollection but two or three of his road's axles had broken in eighteen or nineteen years, and those were under passenger-cars. Their usual service was 2½ years under passenger-cars, when they were turned over to freight-cars. The term of service under tenders was the same. He wished to understand that a vote in favor of the standard axle recommended by the Committee did not bind them to adopt it.

Mr. Sedgley could not vote for the resolution. Where the standard axle had been used under heavy cars on his road it had not given as good satisfaction as a smaller journal. It increased the weight, made it necessary to change the pattern for wheels, or put more iron around the hubs. He thought it not as good as the one he was using, which he considered the best that could be adopted. According to his recollection, in their equipment of 10,000 cars, many long in use, the depreciation does not exceed three per cent under a heavy service. If that is the case, he did not see why they should increase the size of their axe 25 per cent, and the wheel perhaps in proportion. He wished to hear the experience of those who had used the standard axle and their reasons for adopting it. Because the master car-builders had made a mistake in proposing it, should be no reason for this society's adopting it.

Mr. Flynn (Western and Atlantic) thought that two sizes of axle should have been reported by the committee. The standard gauge in the South is five feet. He did not look upon the proposed standard with favor. The axle on his road had these dimensions: journal, 6 x 3½ in.; wheel-seat, 4⅜ in. diameter; axle, 4½ in. diameter. This axle had answered remarkably well. He had adopted it shortly after the war. Previously the diameter of journal was the same as the diameter of the present axle. His road was a succession of

curves from one end to the other. These test axles severely. Perhaps it might be well, in adopting the report, to recommend the master-mechanics to use the form proposed when they can. He could not see any advantage in 7 in. length of journal over 6 in.

Mr. Wilder (Erie Railway) wished to know why that particular size of wheel-seat was adopted, and whether it was to keep up the proportion between wheel-seat and journal existing in the old journal, or to get a stronger axle. If the object was to increase the size of journal to assist lubrication, why could it not be done with the old size of axle? This new wheel-seat is 4⅞ in., the old one was 4⅞. He saw no reason for this increase.

Mr. Wells (Jeffersonville, Madison, and Indianapolis) thought they should not recommend the standard proposed by the committee and recommended by the Master Car-Builders' Association, unless they believe it to be the best. If they can carry loads safely with a wheel-seat 4⅞ in. in diameter, there is no need to increase it. The committee had presented no evidence conclusive to his mind that the size they propose is any better than other sizes in use. The master-mechanics have not the power to change axles. His company had adopted a standard size, and connecting roads had adopted the same size. It would be almost out of the question for it to adopt a different standard. He was opposed to committing the members of the Association in favor of adopting the proposed standard, under the circumstances.

Mr. Carscadin was opposed to the adoption of the standard recommended. All his breakages had been inside of and close to the hub of the wheel. He had never had a journal broken, and had never heard of one breaking. His journals run till 3 in. and even 2⅞ in. in diameter and 6 in. long. They generally turn the axle down about ¼ in. and leave a shoulder, which seems to stop the vibration, and the axle breaks right there. In fitting axles he should leave a shoulder to shove the wheel against. He should not for a moment consider the adoption of the proposed standard axle.

Mr. Brown (Erie Railway) thought that the dimensions of the standard were deduced from the experience of the last 30 years. Thirty years ago cars with six, eight, or ten tons' load were run with journals 3 x 4½ in. successfully, but not with the present lubrication. Now they had to use a greater quantity of lubricator, and had to enlarge the journal to make room for it. By adopting the proposed journal they would indorse the practice of those who furnished the lubricators.

Mr. Peddle (St. Louis, Vandalia, and Terre Haute) was pleased with the fairness of the report, but the resistance of large journals was not dwelt on enough. A case was reported of a Pennsylvania road on which an engine pulls 15 cars with large journals and 18 with small journals up a certain grade. He was satisfied that it was harder to start a train with large journals. He thought the friction in starting much greater than after velocity is attained, and the hauling capacity of engines is limited by their power to start trains.

Mr. Forney (*Railroad Gazette*) said though one member replying to the committee's circular said he could pull more cars with small than with large journals, fifteen or sixteen others had never observed any difference, and there was a great deal of testimony that the large axles drew easier. The committee had reported the exact testimony received, whether favorable or unfavorable to their convictions. He asked that Mr. Richards, who had used the standard axle would report his experience with it. While the Master Car-Builders were considering this subject, Mr. Garey, who has adopted the standard axle, reported an experiment with a car fitted with axles and brasses of three different sizes. The brasses were carefully weighed when put in, and after running a great distance were weighed again. Those with the small journals had lost the most in weight, the middle size a little less, and the largest size least, showing that the friction was least with the large bearing. If a large journal can be used with inferior oil, that is an argument in its favor.

Mr. Richards (Boston and Providence) began using the standard axle eighteen months ago—at first on one car. It was on a line where there had been a great deal of trouble from sand and dust and hot boxes. The first car they oiled every trip, put it on double time, and ran it three months. At last one of the boxes warmed, and no cause could be found at the time. They oiled it and put it on double time again, running to New-York and back twice, and some time later one of the axles was taken out for a bad wheel, and it was found that a piece nearly as large as a finger had gone from the journal. They began altering the whole line; had used up the first hundred axles and begun on the second. They used cheaper oil, and had far less trouble with their boxes than before. The axles were no heavier than some others on Eastern roads. He thought the wear of boxes rather less. They had altered all but two of the cars of one line, and altered several cars for Mr. Wagner, at his request. They had two tenders also with the standard axles. He would not be tempted to go back to the old size.

Mr. Hudson did not doubt that the size recommended was well adapted to existing requirements. It was desirable to have a standard for cars, which go from road to road, but that argument would not apply to tenders, which are kept at home. An inch of difference in size of journal is often necessary, when tenders are made to carry 2500 or 2600 gallons of water. You then increase the weight beyond what is safe to carry, so far as lubrication is concerned, until you get to, say, 3¾ x 6 in. Therefore he favored increasing the length of the journal, which necessitates increasing its diameter; otherwise the liability of breaking is increased. The diameter of wheel-seat was increased to avoid breakage at the back of the wheel. He believed 3 x 6 in. or 3¼ x 6 in. too small for the loads now carried. He remembered when four-wheeled passenger-cars had 1¾ x 3½ in. journals. The size had been gradually increased, and he knew of the adoption of fixed standards at different periods, which failed to become general because they did not provide for the requirements of the future. He had no doubt of the wisdom of increasing the length of journals from six to seven inches or even more.

After some further discussion, the question was put on the resolution recommending the adoption of the standard recommended by the Master Car-Builders' Association. The President being unable to decide by the yeas and nays, a rising vote was taken, when 23 voted for and 35 against adopting the resolution, which was therefore lost.

REPORT ON AXLE TESTS.

Mr. Sellers, from the committee appointed to witness some tests of steel axles made at the Midvale Steel Works, Philadelphia, and some iron axles furnished by members of this Association, reported that the said tests were made at the ship-yard of Mr. John Roach, in New-York. The iron axles were from two roads. Those marked (to distinguish them) brand No. 1, were forged in the shops of the road, and were said to have been made with great care and from good material. The others, marked No. 2, were furnished by a master mechanic, who stated that they were furnished by a maker who had been supplying the road for 15 years, and in all that time had had but one axle broken. The test was made with a drop weighing 1700 pounds, which could be raised to a maximum height of 34 feet. The axles to be tested were laid upon cast-iron standards, rounded at the top, measuring 3 feet ½ inch from centre to centre of standard, these standards being attached to a heavy bed-plate. All axles tested were marked in the centre with chalk, and at a distance 24 inches each side of the centre as the points from which the measure of deflection should be determined.

The first test was of a Midvale steel round bar, 5 feet 3 inches long, 4 1-16 inches diameter.

First blow, 25 feet fall, bent the bar 6¾ inches.

Second blow, 25 feet fall on the reversed bend, came within 3-16 of an inch of straight; that is, did not quite straighten the bar.

Third blow, 25 feet fall, not reversing the bend, deflected the bar 5⅜ inches.

Fourth blow, 25 feet fall, not reversing the bar, increased the deflection 1⅜ inches, bar.

Fifth blow, 25 feet fall, not reversing the bar, increased the deflection 4 15-16 inches.

Two more blows of 34 feet fall bent the bar 3⅜ and 4¾ inches more, and it was laid aside not seemingly injured.

The second test was with a round iron bar, 4 3-16 inches diameter, brand No. 1.

First blow, 25 feet fall, produced 7 inches deflection.

Second blow, 25 feet fall, ½ inch deflection, reversed.

Third blow, 25 feet fall, 7 inches deflection.

Fourth blow, 25 feet fall, ⅝ inch deflection, reversed—crack in under side.

Fifth blow, 25 feet fall, parted the bar.

The third test was with an iron axle, brand No. 2, 3 13-16 inches diameter at centre, 4⅝ inches at ends.

First blow, 25 feet fall, 9½ inches deflection, with a bad crack.

Second blow, 25 feet fall, parted the axle.

The fourth test was an axle of brand No. 2, made in May, 1873, 4⅝ inches diameter at ends, 4 inches at centre.

First blow, 25 feet fall, bent it 8¾ inches, and cracked it badly. No other blow was given this axle, as it was too far gone.

The fifth test was of a steel axle made at the Midvale Works, 4 inches diameter at centre and 4 15-16 inches at ends.

First blow, 25 feet fall, deflected it 6⅞ inches.

Second blow, 25 feet fall, reversed, exactly straightened the axle.

Third blow, 25 feet fall, deflected it 6½ inches.

At this stage it was decided to use 34 feet blows to hurry a fracture in order to see how the steel would look.

Fourth blow, 34 feet fall, deflected it 2⅞ inches more.

Fifth blow, 34 feet fall, deflected it 6¼ inches more.

Sixth blow, 34 feet fall, deflected it 3⅝ inches more.

Seventh blow, 34 feet fall, axle reversed, brought the deflection back to 9⅞ inches.

Eighth blow, 34 feet fall, reversed, reduced the deflection 1⅞ inches.

Ninth blow, 34 feet fall, not reversed, deflected it 5⅜ inches more.

Tenth blow, 34 feet fall, not reversed, deflected it to 12⅛ inches.

Eleventh blow, 34 feet fall, reversed, broke the axle.

The iron axles were of good sound iron in the fracture. The steel one broken had all the appearance of a good quality of steel.

The last test was made with an axle of brand No. 1, to test the 34 feet fall. The axle was about 4 inches in the centre, and was cracked at the first blow.

More New Palace-Cars.

We briefly alluded, in the car-shop notes of our last issue, to the building of a number of palace sleeping-coaches by the Barney & Smith Manufacturing Company, for the Central Pacific Railroad. Two of them have been completed and sent to San Francisco. We copy from a recent number of the Dayton *Journal* a more detailed description of these, and also some drawing-room day cars for the Southern Pacific, in process of construction at the same establishment.

"The general shape of the first-named cars is similar to the standard Pullman, many of which have been built by the B. & S. Co. within the past ten years. Their color is a light shade of canary, with light tracings, and scroll-work of darker and contrasting shades. The interior is finished in black American walnut, oiled, and most elaborate veneering of French walnut, engraved with fine lines of gold, and decorated with shields of unique marquetry, containing the monogram of the railway company in ivory on ebony. The silver lamps, with shaded glass globes, the highly finished wood, elaborated with silver fixtures, in shape of curtain-rods, coat and hat pins, and the embossed French plate glass and mirrors, give almost a dazzling tone to the entire coach. The seats, chairs, and sofas are upholstered with the finest grade of Cerise plush. The floor is covered with Brussels carpet, made expressly in colors and design to harmonize with the general finish. The windows are shaded with damask curtains, on spring rollers, which also, in color and figure, carry out the completeness of the interior finish. The berths are equipped with spring and hair mattresses, of the very best quality, linen sheets, pillow-cases, etc.; in fact, every necessity and luxury possible to imagine.

"The body of the coach contains a smoking-room, with an inlaid floor, supplied with a sofa and lounging-chairs. This room is entirely disconnected from the main room, yet easy of access by means of a short passage which leads into the sleeping or parlor portion of the car. This room is divided into twelve sections, each section supplied with four seats, or two berths, two double-sash windows, damask shades, and embossed mirrors. Each of these compartments is so arranged that it may be entirely closed from the others, and by the addition of a movable table, converted into a dining-room.

"Next to the smoking-room there is a larger and entirely private state-room, supplied with arm-chairs and a sofa, together with a ladies' dressing-room, complete in each detail. At the opposite end of the car are the general wash-room, closet, and steam-heating arrangement, all finished with corresponding elegance.

"The drawing-room day coaches for the Southern Pacific are of the same general appearance outside as the above, but are finished inside with an artistic combination of mahogany and rosewood, engraved with tracings in gold of leaves and flowers. These woods are so highly finished, and so handsomely carved, that they form a unique work of art. Revolving fauteuils, upholstered with crimson velvet, placed before French plate-glass windows, 5x3½ feet, form the seating arrangements.

"The large windows are draped with dark brown satin lambrequins, brown and gold damask curtains, and light shades on spring rollers. Between each window, from floor to roof, are handsomely embossed French plate mirrors, in elaborately-carved frames of mahogany and rosewood. A carpet of brown, crimson, and gold, completes the effect, and makes the car the cosiest, as well as the handsomest, drawing-room we expect to see in a good while. If it was pleasant to notice all the effort made for beauty and comfort, it was more interesting to notice the thorough care and rigid examination to which every portion is subjected before it is permitted to form a part of the whole.

"The testing of several axles, selected from a lot just received, was an interesting process. These, though guaranteed by the makers as samples of the lot, were placed under the 'drop,' and subjected to five successive blows, each equal to a weight of 120,000 pounds. The test simply bending and not breaking the fibre of the axle, proved them fit for acceptance and service. Every observer would be convinced that these fortunate Californians were to be as thoroughly safe as they must be luxuriously comfortable in their palace-cars."

One of the Early Railroads.

In 1827, a committee was appointed by the Baltimore and Ohio Railroad Company, then in its infancy, to examine the only two railways then in existence in this country—one being at Mauch Chunk, Pa., and the other at Quincy, Mass. The latter was the first line exceeding one mile in length constructed in the United States. The following extract from the report is an interesting description of its cost, methods of construction, and working:

"The Quincy Railroad, including all expenses, except the amount paid for land, cost $11,250 per mile. It was constructed exclusively for the purpose of conveying stone from a quarry to navigable water; it is 3 miles long, and consists of a single way, with 2 tracks, 5 feet apart in the clear; the rails are of pine timber, 6 inches wide and 12 inches deep. These rails, except where the road passes over a swamp upon wooden piles, are laid upon stone sleepers 8 feet long and about 12 inches square, placed 8 feet apart. The sleepers rest upon a stone foundation 3 feet deep, which effectually secures them from the operation of frost. On the top of the wooden rails, there is nailed oak scantling, 2 inches thick and 4 inches wide, on which is fastened a bar of rolled iron $\frac{5}{16}$ of an inch thick, and from $2\frac{1}{2}$ to $2\frac{3}{4}$ inches wide. The road at the quarry is 86 feet above the water at the place of its termination. The deepest cut is 24 feet, and the entire road is nearly straight, except at two places, where there are considerable bends in it. The greatest descent is $2\frac{1}{2}$ inches to the rood, which is equal to about 66 feet in a mile; and at this place a strong break is necessary to keep the wagons from running upon the horses. Two horses draw down the road 40 tons, including the weight of the wagons, at a rate of $4\frac{1}{2}$ miles an hour, and take up the empty wagons, weighing about 6 tons. These wagons cost $400 each, and have wheels $6\frac{1}{2}$ feet diameter, with 1 inch flanges, the wheel turning *upon* the axle, whereas, at Mauch Chunk, the wheels are 2 feet diameter, with flanges of 1 inch, and are turned *with* the axle. There are several deep ravines crossed by this road, which are passed on wooden frames at a much less expense than it would have cost to fill them with earth. The iron rails for this road were furnished, completely drilled and fitted, ready for laying down, at $6\frac{1}{2}$ cents per pound, and the pine rails were delivered to the company, at their wharf, for 13 cents the cubic foot. The work appears to be executed in a faithful manner, and has been found to answer the fullest expectation of the proprietors, having reduced the expense of transportation to about one sixth of its former cost."

Houlton's Automatic Lubricating Axle-Box.

The design of this invention is to do away with some of the objectionable features of axle-boxes in general use—namely, the use of packing to keep the oil in contact with the journal; the unnecessary waste of oil caused thereby; the use of a wedge or key over the brass, and the imperfect fitting of the ordinary boxes around the axle.

A perspective or outside view of box is shown in Fig. 1, with sliding cover at its front end, secured in place by spring and key-bolt fastenings. The inner side is concave at the bottom, and fitted to receive a draw, shown in cross-section, Fig. 2. The inner end of the draw is semicircular in form and fits perfectly under the axle; the upper half of the circle being formed by a wooden slide inserted from the top of the box directly over the inner end of draw. There is a recess in the circular end to receive a narrow strip of leather, to make a more perfect joint under the axle. Within the draw is the oil-chamber, shown by the dark shading, Fig. 2, in which is placed the lubricator, Fig. 3, provided with a wick, which supplies the oil to the journal by capillary attraction, the spiral springs keeping the same constantly in contact with it. The fastenings of the box-cover can be instantly removed, the key-bolt being a tool for that purpose. The draw is held in place by a small spring-bolt shown on side of box.

Fig. 1.

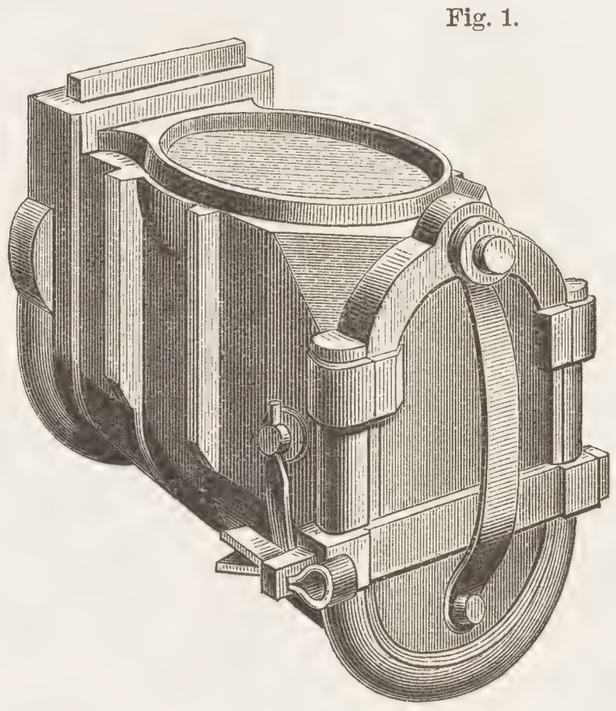
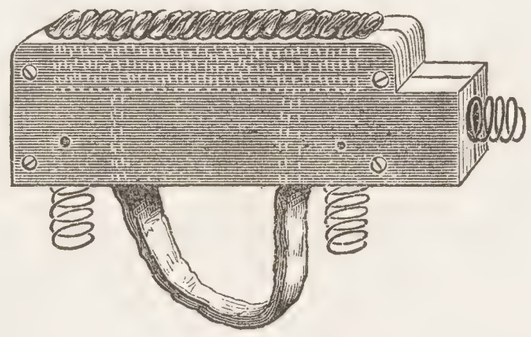


Fig. 2.



Fig. 3.



In putting a car in running order (the boxes being already on the journals), raise the box, put the brass in its place—the draw not being in—saturate the wick completely with oil, withdraw the spring in the side of box so as to allow the draw to enter, put a half pint more or less of oil in the draw, press down on the wick to allow it to pass under the button of the axle, push the draw into its place, and the wick is then in contact with the journal, and is constantly kept there. Constant lubrication takes place so long as there is any oil in the wick or oil-chamber.

It is claimed that a set of brasses by this arrangement will last twice as long as when used in the ordinary way; besides, there is not half the oil consumed, and a great saving also in time and trouble in being rid of the ordinary packing. The brass is used without a key, is $5\frac{3}{4}$ inches in length, with a shoulder at each end, and fits corresponding recesses in top of box. The entire box, including brass, weighs 66 pounds.

Further particulars may be obtained by addressing the patentee, G. Houlton, St. Andrew's, New-Brunswick, or Henry Osburn, St. Stephen's, N. B.

A New Discovery—Glass Rendered Tough and Unbrittle.

We copy from the *London Times* the following account of this important discovery. Specimens of glass subjected to the treatment described, have been tested in this city, and were found to resist fracture to an extent which fully confirms the statements below:

"About seven years since, M. François de la Bastie, a French engineer, after a long and patient investigation into the subject, discovered a simple means of rendering glass practically unbrittle, and at the same time of preserving its transparency. Broadly stated, it consists in heating the glass at a certain temperature and plunging it while hot into a bath consisting of a heated oleaginous compound. There are, however, many conditions in connection with the details of the process upon which a satisfactory result depends, and the neglect of any, even in a slight degree, constitutes the difference between success and failure. Thus, the glass may be underheated, and will not be susceptible to the effect of the bath; or it may be overheated, and it will then lose its shape; or, again, it may be rightly heated, and yet be spoilt in the course of transference to the bath. Moreover, the oleaginous constituents of the bath and their temperature have an important bearing upon the ultimate result. These and numerous other points of detail have all been satisfactorily settled by M. de la Bastie, who has designed furnaces and baths by means of which his toughening process can be carried out practically without fear of mischance. The time occupied in the actual process of tempering is merely nominal, for directly the articles are brought to the required temperature they are plunged into the bath and instantly withdrawn. The cost of tempering, too, is stated to be very small.

"The physical properties of the material become altered in a very remarkable manner. To this singular fact we can testify, from the inspection of a number of toughened glass articles, which consisted of watch-glasses, plates, dishes, and sheet-glass, both colored and plain; neither transparency nor color is affected at all, and the ring or sound only slightly. These articles, some of them being exceedingly thin, were thrown indiscriminately across a room against a wall, and fell spinning on the deal floor. Water was boiled in a saucer over a fire, and the saucer was quickly removed to a comparatively cold place, and was unaffected by the sudden change of temperature. One corner of a piece of glass was held by the hand in a gas-flame until the corner became exceedingly hot, but the heat was not communicated to the other portion of the glass, neither was it cracked from unequal expansion. A comparative experiment was then made with a piece of ordinary plate-glass and a similar piece of toughened glass, in order to show their respective powers of resistance to fracture from the force of impact by a falling weight. In each case, the glass was about 6 inches square, and was placed in a frame, the weight being dropped upon its centre. With the ordinary glass, a 2-ounce brass weight, falling on it from a height of 12 inches and 18 inches respectively, did no damage, but at 24 inches the glass was broken into several fragments. With a thinner piece of toughened glass, no impression was made by the same weight falling from heights ranging from 2 feet to 10 feet, the weight simply rebounding from off the glass. An 8-ounce iron weight, tried at 2 feet and 4 feet respectively, gave similar results. Upon the height being increased to 6 feet, however, the glass broke. But here another singular result was produced; instead of breaking into about a dozen pieces, as did the ordinary glass, it was literally smashed to atoms. The largest fragments measured half an inch in length and breadth, and these were easily reduced by the fingers to atoms varying in size from that of a pin's point to that of a large pin's head. The lines of fractures in the fragments presented to the eye the appearance of irregular lace-work, and these lines were,

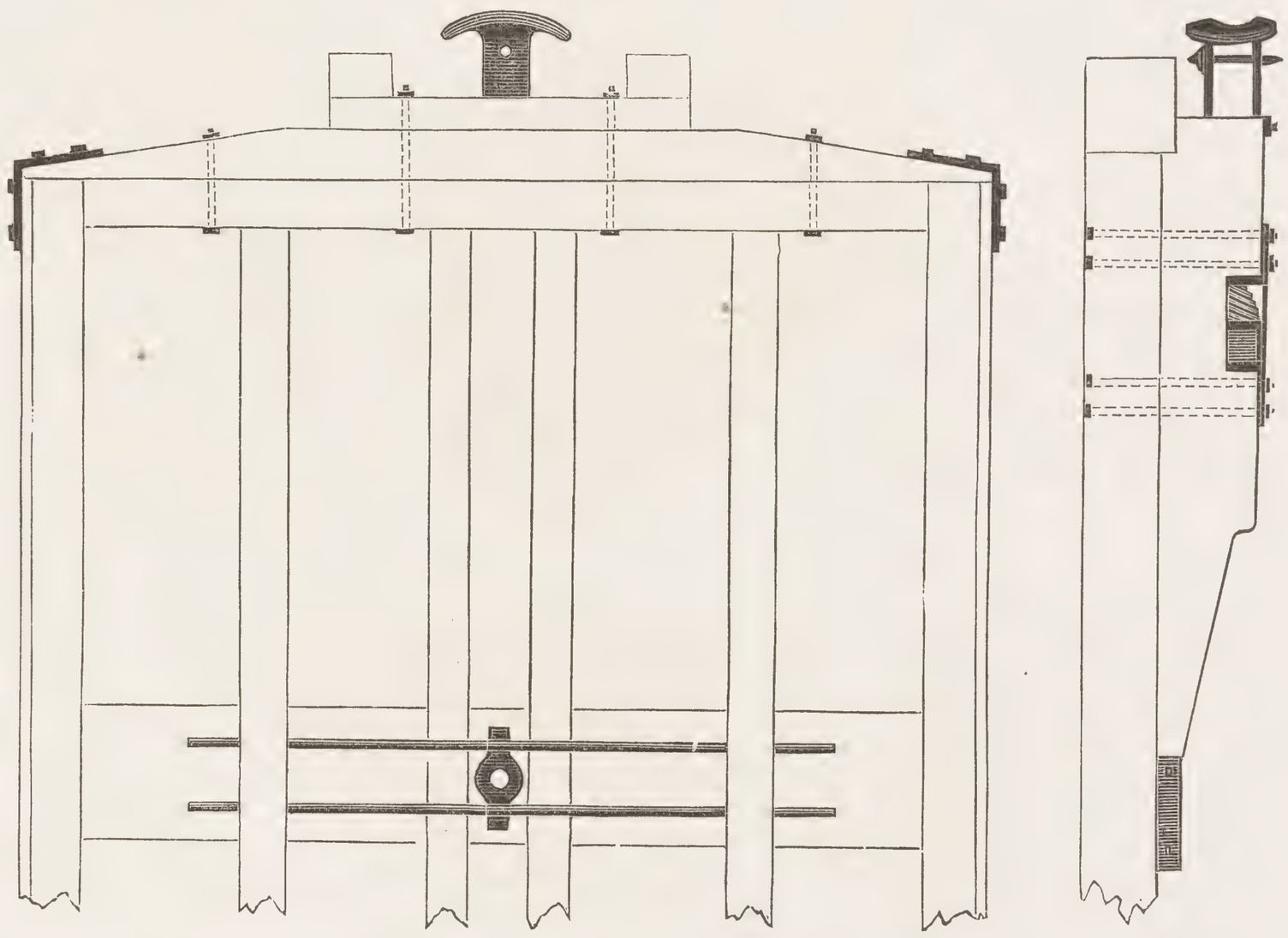
moreover, apparent to the touch, but more palpably so on one side of the glass than the other. Which of the two sides was the one that received the first impact of the blow, we were not able to determine. Another peculiarity is that the edges of the fractures are by no means so sharp, and therefore capable of causing incised wounds, as are those of ordinary glass. It would seem that the toughened glass possesses enormous cohesive power; but that if the equilibrium of the mass is disturbed at any one point, the disturbance or disintegration instantly extends throughout the whole piece, the atoms no longer possessing the power of cohesion.

"Of the practical nature of M. de la Bastie's unique discovery, there can be no question whatever, nor can there be any doubt of its value in the arts, sciences, and manufactures. The applications which suggest themselves are innumerable; and above and beyond the usefulness of the process with regard to articles of domestic use, come important considerations affecting the applied sciences, especially in connection with chemical manufactures and similar industries, where a material alike uninfluenced by the action of heat or acids has been so long and so vainly sought for—notably in connection with vitriol chambers in the manufacture of sulphuric acid, and for piping in chemical works. For the present, there remains one purpose to which toughened glass can not be so easily applied, and that is to window-glazing in odd sizes, inasmuch as it can not be cut by a diamond or other ordinary means. Our glaziers will therefore have a respite, but we can not give them much hope that it will prove a long one, as experiments of considerable promise are being conducted with the view of solving this problem. Moreover, the glass can be cut to the proper sizes before toughening, if desirable. The glass, however, is readily engraved, either by fluoric acid in the usual way, or by Mr. Tilghman's elegant sand-blast process. It can be easily polished, and it can also be cut by the wheel, as for lustre-work and the like."

Floor-Framing of Freight-Cars.

THE drawings represent the floor-framing and draw-head attachment of a style of freight-cars in use on the Philadelphia, Wilmington and Baltimore Railroad, and also upon other smaller lines in that vicinity. The usual size is 28 feet long by 8 feet wide, outside of frame. No longitudinal truss-rods are used. The dimensions of timbers are as follows: Side-sills, $5\frac{1}{4}$ x $7\frac{1}{2}$; end-sills, 6 x $7\frac{1}{2}$; beveled guard timbers bolted to end-sills, 5 x $7\frac{1}{2}$, intermediates, 4 x $7\frac{1}{2}$; transoms, 5 x $13\frac{1}{2}$; draw-head timbers, 3 x 10; buffer-blocks, 9 x 7; distance from centre of transom to end of side-sills, 5 feet. The drawings are to a scale of $\frac{1}{2}$ an inch to a foot.

This style of framing is regarded by many builders as affording a very strong resistance to end-collisions, while the weight of the car is not increased. The beveled timbers in front, in connection with the buffers, afford a very convenient platform to stand upon while coupling; the ends of these timbers are flush with the side-sheathing, and are secured at the corners by angle-irons (7 x $\frac{5}{16}$), fastened by three wood-screws on sides and ends. The only objectionable feature we notice in this method of construction is that the end-sills are tenoned into the side-sills. We think if this arrangement were reversed, and the side-sills framed into the end-sills, a very considerable increase of resisting power would be secured, with no drawback whatever. The longitudinal timbers are yellow pine, and the transverse pieces are oak.



THE Ramapo Wheel and Foundry Company have recently received a number of large foreign orders for wheels, and are also very busy upon orders for passenger and engine wheels for home roads. This demand on the capacity of the works has caused a large increase in the wheel product of this well-known establishment, and is a flattering indication of the superior quality of the work done, and of increased activity in this line of manufacture.

A SIMPLE method of testing for hydrocarbons or mineral oils in lubricators is to fill a bottle with the oil in question, moistening the cork and inside of the neck of the bottle, and then twisting the cork about its longer axis. The best lubricating oils produce no sound, but the more the oil is adulterated with hydrocarbons and products of dry distillation, the louder the noise produced. An oil that gives a loud cry is most unfitted for a lubricator.

A CEMENT for mending steam-boilers may be made by mixing two parts of finely powdered litharge with one part of very fine sand and one part of quicklime which has been allowed to slack spontaneously by exposure to the air. This mixture may be kept for any length of time without injuring. In using it, a portion is mixed into paste with linseed-oil, or, still better, boiled linseed-oil. In this state it must be quickly applied, as it soon becomes hard.

A DELEGATION of the Philadelphia Common Council, on their way to attend the Concord and Lexington Centennial, were taken on a special train from Stonington to Boston, a distance of 94 miles, in one hour and forty-nine and a half minutes. A portion of the distance was run at the rate of over a mile a minute. The engine had $5\frac{1}{2}$ foot drivers and cylinders 17 x 22. The road-bed is of the best quality, and is laid mostly with steel rails.

AT a recent meeting of the friends and officers of the Springfield, Jackson and Pomeroy Narrow-Gauge Railway, in Cincinnati, O., it was resolved that work would not be begun until $800,000 had been subscribed. The road is just 100 miles in length; and if the sum named is subscribed, a bonded debt of not more than $500,000, or $5000 per mile, will be necessary. The amount thus far subscribed is $628,000.

ILLINOIS railroads do not make a favorable showing for the Granger movement. According to a report of the railroad committee of the State legislature, there are in the hands of receivers thirteen roads, having a total length of 2287 miles of track, with a total indebtedness of sixty-four and one half millions of dollars. A million and a half of this debt is in taxes due and unpaid to the State.

THE following is one of the mottoes recently borne on the banners of the striking miners, at Wilkesbarre, Pa.: "No surrender till hell freezes over, and then we'll crawl out under the ice."

A CONTRACT to build 40 freight-cars for the Fitchburg Railroad has been given to the Ranlet Car Company, of Laconia, N. H.

THE Harrisburg Car-works have resumed work on a contract for two hundred cars. This employs only one-third of their force.

MR. EDWIN LOCKWOOD has resigned his position as Master Car-Builder of the New-York Division shops of the Pennsylvania Railroad. Mr. Lockwood has been for many years in the employ of the Camden & Amboy Company, and of the Pennsylvania since the lease. He was in charge of the car-shops at Bordentown, from the time they were built until they were broken up and transferred to the new shops on the Hackensack Meadows, since which time he has been in charge of the latter.

ON the trains of the Pennsylvania Central Railway ten cents extra is collected from each passenger who is unprovided with a ticket. The conductor is required to issue a drawback ticket for the extra charge. The passenger can collect ten cents by presenting this ticket at any office on the line. The new plan has been authorized by the Legislature, and, it is expected, will effectually prevent conductors from making false returns of moneys collected.

THE Baxter Steam Canal-Boat Company intend to increase their fleet on the Erie Canal, during the coming year, to one hundred boats. During the year 1874, the boats of this company made thirty-nine round trips from Buffalo to New-York and back.

AT the annual meeting of the Railroad Purchasing Agents' Association at St. Louis, May 13, the following officers were chosen for the ensuing year: President, Wm. S. Cuddy, St. Louis, Iron Mountain & Southern; First Vice-President, J. T. Sterling, Toledo, Wabash and Western; Second Vice-President, A. C. Armstrong, Lake Shore & Michigan Southern; Secretary and Treasurer, E. W. Porter, Canada Southern; Executive Committee, G. C. Breed, Louisville & Nashville & Great Southern; E. O. Cherry, Indianapolis, Cincinnati & Lafayette; G. M. Babcock, Missouri, Kansas & Texas.

THE friends of Mr. J. B. Sutherland, who recently resigned his position as superintendent of the locomotive and car department of the Michigan Central Road, after many years' service, have presented him with a library of 200 volumes, accompanied by resolutions expressive of their respect and esteem, the latter being very handsomely engrossed and framed.

The National Car-Builder

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JAMES GILLET, EDITOR.

Terms, $1.10 per Annum.

JUNE, 1875.

Editorial Announcements.

CORRESPONDENCE.—*We cordially invite the co-operation of the railroad public in affording us the material for a good mechanical paper. Articles relating to rolling-stock and machinery, by those practically acquainted with those subjects, will be gratefully received. All communications must be addressed to Vose, Dinsmore & Co., No. 32 Warren Street.*

ADVERTISING RATES.—*For one square, or one fifth of a column, $5 per month, or $50 a year. For half a square, $3 per month, or $25 a year. Larger advertisements by special contract.*

All communications in regard to advertising should be addressed to L. F. DINSMORE, *Post-Office Box* 4055, *New-York City, who is our agent for advertising, and authorized to make contracts, collections, etc.*

Notice to Subscribers.

WE have inclosed in recent issues of the CAR-BUILDER a large number of bills to subscribers who are in arrears for subscription. Many of these bills received prompt attention, but not all of them; and the object of this notice is to request those of our readers who have not already remitted for the current year to do so at once. The price is only $1.10 per annum, postage prepaid.

The Master Car-Builders.

OF the many societies which hold their anniversary meetings at this time, there are none that have more important or responsible duties to perform than the associations that represent the mechanical departments of railroads. The improvements which mark the progress already made, instead of narrowing the field of investigation, have tended to widen it. What at one time seems to be the goal with respect to any particular method or appliance, proves to be but a new starting-point in the light of subsequent discovery. The obstacles, as they are successively overcome, develop new ones; or rather the effect is to stimulate further efforts to accomplish what was before unattempted or was considered impracticable. If this is true with respect to railway construction and operation as a whole, it is equally true of each mechanical department in its multiform details, and especially as respects the car department whose representatives will in a few days convene for their annual conference and consultation.

The vast number of passenger and freight-cars now in active service, and particularly those of recent construction, exhibit great improvements as compared with those built twenty years ago. They are in many ways better adapted to their work, are provided with more safeguards and capable of longer and better service; yet there is, after all, no very near approximation to any thing like a recognized standard for any particular class of cars or for any one essential feature pertaining thereto. The diversity in construction indicates a corresponding diversity of opinion and of individual experience. Nothing is considered quite up to the mark of perfection. There is an eager looking forward for something better, a reluctance to give any thing more than a qualified indorsement of present methods, and a patient waiting for inventors to bring out something new. That this is about the actual condition of things is manifest from a glance at the annual reports of the Master Car-Builders' Association for the last two or three years. The aim of the Association is, as we understand it, not so much to determine what is best for all time, as to ascertain what is most fully approved by present experience, and to apply the same so as to bring about greater uniformity in general construction, and especially in the numerous details where the lack of uniformity is the cause of so much trouble, delay, and expense. What is absolutely the best in any given case, say an axle-box, draw-head, or coupler, may not be ascertained during the present century; but uniformity to at least a greater extent than now exists is a present necessity. A crisis has been reached in the progress of railroads in this country when some permanent reduction in the cost of operation and equipment, as well as an increase in the proportion of paying freight to dead weight, is necessary in order to insure the profitable working and well-being of the system. To what extent the car-builders as an association can contribute to this result, is a question which will test the practical usefulness of their organization. It is a question of economy, the best adaptation of means to ends, the prevention of waste, and the employment of labor and material to the best mechanical advantage.

The Association is now eight years old; old enough to have a history and prestige, and a capacity of doing its work according to effective, well-considered, and well-tried methods. It has already made its mark and established a reputation; but representing as it does a subordinate department, its decisions are little more than recommendations until they are approved by superintendents and managers. Now, the question is, can any substantial progress be made by merely talking over these subjects at every meeting, and appointing committees to make inquiries? In our view of the case, very much depends upon the thoroughness of the work done by committees in collating and presenting facts, data, and statistics, so that after these have been considered and discussed, there will be a sufficient unanimity of sentiment to warrant an expression of the sense of the convention in the form of a resolution or otherwise, in regard to the merits of particular methods and appliances. A mere interchange of opinion at stated periods, without any mutual agreement as to what is best, can hardly be expected to lead to the early adoption of a uniform brake, axle, draw-head, or other appendage by all the roads. The superior officers whose approval and co-operation are necessary in such cases, would be very likely to ask how the vote stood on the question; and if the point was found to have been carried by a bare majority, they would be apt to fall back upon their own opinions, or withhold their approval until the Association could better agree among themselves. It seems to us that, in order to bring about the uniformity so much desired in the construction of cars, the Association can exercise a very great influence. But to that end, it must, as an organized body, place upon record its deliberate conclusions, and these should be so well sustained by experiment and demonstration as to command assent in the face of adverse opinion or prejudice.

It is an easy matter to appoint committees and pass resolutions. It is also comparatively easy to get out circulars every year, with a dozen questions or so attached to each, designed to draw out the experience of those to whom they are sent upon this, that, and the other topic. It is equally easy to fill up the blank lines, conveniently arranged by the printer, with "yes" or "no," or "we do," or "we don't." The committees wait as long as the time will allow, and then do the best they can with the scanty materials in their possession. The result is a report that is little better than an apology, hurried, superficial and crude, unsatisfactory to themselves and the convention, and if it is published in the minutes, is rarely or never referred to afterward as containing any information of special value. In many instances, committees are unable to make any report at all from sheer lack of the necessary information, while in some exceptional cases, we are glad to say, the reports have been highly creditable both to the committees and the Association. We are aware that this kind of fault-finding is not a new thing. We do not often indulge in it, however; but we wish to say just for once, that the growth, prosperity, influence, and usefulness of the Car-Builders' Association require that every member should do, not merely his duty, but a great deal more than his duty. It is the *extra* work that tells.

The Master Mechanics' Convention.

THE recent meeting of the Railway Master Mechanics' Association in this city, as respects the numbers in attendance, the variety and importance of the subjects discussed, and the general tone and spirit of the proceedings, will compare favorably with any of its previous meetings. We give as full abstracts of the reports and discussions as our limits will permit. If no very definite or positive conclusions were arrived at upon any of the topics presented, it was doubtless owing to the want of the necessary information upon which to base such conclusions. Most of the problems discussed at such meetings involve collateral questions of mechanical dynamics and a variety of phenomena attending the use and application of material, which can only be solved by protracted experiment and observation. Progress toward final results is necessarily slow. Upon many leading questions, there is great contrariety of opinion and experience. This was fairly exemplified in the lengthy discussion as to whether steel or iron is the most suitable material for locomotive fire-boxes. So far as the experience of the members was drawn out, the testimony was so conflicting as to leave the matter about where it was at the start. The discussion, however, was a profitable one in so far as it directed attention to the real nature, quality, and properties of steel, and the treatment it should receive in order to adapt it to the purpose required. The different theories advanced in regard to the causes of fracture, and the manifest difference in the quality of steel furnished by different manufacturers for a like purpose, will stimulate further inquiry, and thus result in a benefit to all parties concerned. What was said and done, or rather not done, on this particular subject, will also help sustain the views expressed by Mr. Britton in his opening address, questioning the propriety of any definite action by the convention upon the subjects discussed, and leaving each member to appropriate in his own way the benefits derived from the annual meetings with respect to what is best in material and construction.

The action of the convention upon the report of the committee on standard axles, being of a strictly negative character, harmonized with the above suggestions of the President. For the time being at least, each member is left to judge for himself as to what are the proper dimensions for a standard axle. As a collective body, they declined to approve the size of axle agreed upon by the Master Car-Builders, the majority objecting to it mainly on account of its weight and diameter of wheel-seat, both being considered excessive or more than they need be. This negative action is to be regretted, as it leaves the question open for another year at least, and postpones the adoption of a standard to some indefinite period in the future, if indeed such a thing shall turn out to be ultimately practicable. Such will certainly not be the case if the leading roads of the country agree to disagree about it. If the axle recommended by the master car-builders, and already adopted by several important lines of road, can be modified so as to meet the views of objectors, the sooner the points are ascertained and settled the better. The report of the committee on the subject will be found in its place in the proceedings.

The members of the Association, during their stay

in the city, partook of sundry entertainments provided by a committee of the merchants and manufacturers, including a visit to the Fifth Avenue Theatre, a ride through Central Park, and a steamboat excursion upon the bay and river, all of which was thoroughly enjoyed by the recipients and also by their entertainers. The meeting next year will be held in Philadelphia.

Scrap Castings.

EVERY railway machine and repair shop has its scrap-heap, made up of the accumulated debris of the line, fragments of wrecks, rejected devices, and a miscellaneous assortment of broken and worn-out odds and ends, corresponding to the traditional rag-bag of an economical household. The difference between the first cost of this mass of material and its market value as scrap, constitutes an important item of railway expenditure. To reduce this item to a minimum and avoid unnecessary waste, it is necessary to utilize the scrap-pile to the utmost. Much the largest portion is cast-iron, which it is the practice of many roads to sell to the foundries for remelting, the roads receiving a credit for the same at the rate of 1½ or 2 cents per pound, as against the new castings furnished. This is a very good and economical operation, provided the cost and quality of the new castings are not unfavorably affected thereby. A good casting, especially for railroad purposes, necessarily implies good stock, with no admixture of second-hand material. An old casting can no more be restored or transformed with respect to quality and intrinsic worth into what it was originally, than the contents of a rag-bag can be made into a new and unworn garment. The rags are exceedingly valuable for the making of paper, and so is old cast-iron for many indispensable uses, but it should never be permitted to again form a part of the essential mechanism of cars or locomotives where strength, lightness, and durability are the prime requisites. The attempt to do so is false economy. No railroad can afford to use inferior castings, even if the scrap-heap is materially reduced thereby.

It is well known that every remelting causes the iron to absorb an additional quantity of sulphur, and if the process is repeated seven or eight times, it becomes very much like pot-metal. The castings furnished by job foundries in exchange for scrap, are usually subjected to but little cutting or drilling by way of test. They are put at once in their places, under the impression that they are as good as the service requires, when in reality they are only as good as the stipulated price will warrant. They are job castings bought at barter price; and in order to be sufficiently strong must be excessive in weight. The road buys back its old rubbish in a new form, and rarely or never finds out the extent of the damage because it can not be definitely estimated. The first cost is the only thing looked at, and this is deceptive and misleading. The cost of hauling every pound of superfluous weight is just as great as if such weight were essential; and every one knows how rapidly small details in railroading grow into enormous aggregates. The only corrective of this practice is for roads to do their own foundry-work and see the stock that goes into it. Every casting can then be made lighter in proportion to the quality of the iron, and with no sacrifice of strength or durability. What then, it may be asked, must be done with the old castings? We answer, sell them at whatever price they will command in the open market. If there is no sale for them, it is a greater reason why they should not be incorporated into new ones, to lay the foundation of accidents and in various ways tax the resources of the roads.

Car Ventilation Once More.

THE *Daily Times* of this city, in a recent editorial on the subject of car ventilation, refers to some observations made by a Russian engineer on an American-built car carrying fifty passengers, and running as third class between St. Petersburg and Moscow. The outside temperature at starting was 22°, Fahrenheit, below zero; the inside 16° below, and there was no fire or means of heating except that furnished by the eighty passengers themselves. But, from the mere accumulation of animal heat, the temperature gradually rose, until in nine hours it was in the upper part of the car 21° above zero, a rise of 37°, but on the floor the thermometer indicated 6° below zero, a difference of 27° between the head and feet of a standing passenger. Carbonic acid, the great air-poisoner, increased to alarming proportions. At starting it was .140 per cent, but at the last hour the tests showed .940 per cent.

It must be admitted that in a case like this the problem of ventilation is rather a hard one to deal with. The passengers evidently had to make a choice between freezing or keeping warm by the mere accumulation of animal heat—between the breathing of fresh air at a temperature of 22° below zero, or carbonic acid at 21° above zero. In this country the great majority of passengers, whether on steam or horse-cars, would choose the latter alternative, bad as it is, as more likely to prolong existence, or at least to make it more comfortable while it lasts. The writer refers to the horrors of our city street-cars, crowded with compact masses of uncleansed humanity on damp and oppressive days, and admits there is no remedy but the opening of doors and windows; and in this he is quite right.

With respect to steam-cars, however, with their complement of fifty or sixty passengers, we believe it is no very difficult thing to secure tolerably good ventilation in summer, and also comfortable warmth and wholesome ventilation in winter. We are slowly getting hold of the actual conditions of the problem, and these once clearly understood, the appliances adapted to such conditions will be forthcoming. The usual top and side ventilators, in connection with doors and windows and wire-gauze screens, must be relied upon in warm weather when fires are not needed. In winter the case is essentially different. Then the temperature must be kept comfortable, and, as far as possible, uniform; the warmed air must be utilized and not wasted; the impure and vitiated air, including the cold strata near the floor, must be exhausted; and passengers must not be subjected to cold draughts from the outside. Now all this can most certainly be provided for by introducing the currents of fresh air from without into drums or chambers surrounding the stoves or furnaces, and from thence into the car; while a corresponding quantity of cold and bad air is constantly forced out through exhaust openings in the car-side next the floor, and communicating with vertical flues running up to and through the roof. This plan secures a constant supply of warmed air at the top, and a constant exit of cold and contaminated air at the bottom, where it naturally falls, even without any pressure from above, by its greater specific gravity. This, it will be seen, combines heating with ventilation, and makes the former an effective instrument in promoting the latter. We design only to indicate the general principle in its application to railway-cars in winter, and as one which seems to meet all the requirements of the case.

Vose, Dinsmore & Co.

WE call the attention of our readers to a partial change which has recently been made in the business of this firm. In order to improve and extend their facilities for the manufacture and sale of railway-car springs, and devote themselves more exclusively to this, their leading specialty, they have disposed of their entire stock of miscellaneous railway supplies to Messrs. L. G. Tillotson & Co., the well-known supply dealers of this city, who will execute orders in this line on the most favorable terms for purchasers.

In thus restricting their business to the manufacture of springs, Messrs. Vose, Dinsmore & Co. will, with their increased capacity, continue to supply the market with the standard varieties. In the course of their long experience, they have originated and introduced nearly every kind of car-spring that has stood the test of prolonged service—a fact that is due to the use of the best material, and the employment of the most skillful workmanship.

The Convention—Committees and Subjects for Discussion.

THE members of the Master Car-Builders' Association will assemble, for the holding of their ninth annual convention, on Wednesday, June 9th, at the Grand Central Hotel, 671 Broadway. The following are the committees appointed last year, and the subjects severally assigned to them to be reported upon and discussed at the present meeting:

On Brakes.—R. S. Ramsey, of the Pennsylvania Railroad; George Hackett, of the Central of New-Jersey; and G. W. Demarest, of the Northern Central.

On Heating, Lighting, and Ventilating Passenger-Cars.—W. E. Chamberlain, Boston and Albany; V. D. Perry, Hartford, Providence, and Fishkill; A. Gleason, Old Colony and Newport.

On Appliances for Replacing Cars on Tracks.—W. J. Calais, Wilmington, Columbia, and Augusta; J. N. King, Chesapeake and Ohio; H. Longest, Richmond, Danville, and Piedmont.

On Best Remedy for Hot Journals: their Treatment; Best Metal for Bearings; Best Lubricating Oils and Packing Material.—Messrs. J. W. Holmes, Atlantic and Great Western; J. D. McIlwain, Lake Shore and Tuscarawas Valley; and H. Steinbrunner, Cleveland and Pittsburg.

On Draw-Bars and Buffers.—F. D. Adams, Boston and Albany; C. A. Smith, late of Erie Railway; L. Garey, New-York Central and Hudson River.

On Best Style and Most Economical Truck for Freight-Cars; Best Position and Hanging of Brakes and Position of Brake-Shaft (right and left hand), when Standing on the Car.—D. Hoit, New-York Central and Hudson River; John Kirby, Lake Shore and Michigan Southern; and W. F. Smith, Cleveland, Columbus, Cincinnati, and Indianapolis.

On Size and Framing of Passenger and Freight-Cars, with Instructions to recommend suitable sizes for same.—W. R. Davenport, Erie Car-Works; E. A. Olmstead, New-York Central and Hudson River; H. A. Webster, New-York, Boston, and Montreal.

On Car-Wheels; Best Method of Fitting; Flange Wear and Causes; Mileage and Breakage.—H. O. Wadlie, Illinois Central; John Kirby, Lake Shore and Michigan Southern; D. Hoit, New-York Central and Hudson River.

Steel and Iron Car-Wheels.

To the Editor of the National Car-Builder:

DEAR SIR: A communication, signed "M.," upon the comparative merits of steel and iron car-wheels, was published in the February number of your journal, and in which the writer, as it seems to me, exaggerates the cost of the former or steel-tired wheels, as compared with that of chilled-iron wheels. He assumes in the outset that a lathe costing $4000 is necessary for the manufacture of the former, and that such lathe would only turn out four wheels per day. Now, if the cost of a lathe is to be introduced into the calculation, why not also the cost of an hydraulic wheel-press which is used for removing and replacing chilled wheels? That the cost of such lathe as well as its capacity is wrongly estimated, will appear from the fact that lathes designed for this purpose, and capable of turning sixteen wheels per day instead of four, can be bought for $2000.

It seems to me that a much fairer way of treating the subject would be to assume a certain mileage for an average steel-tired wheel, and then the number of chill-

ed-iron wheels that would make the same aggregate mileage upon a fairly estimated basis for each. Let us suppose that a set of each kind of wheels be placed in the trucks of two locomotives of the same class, the cost of the locomotives being $12,000 each. Your correspondent concedes to a steel-tired wheel a maximum mileage of 300,000 miles, and to a chilled-iron wheel 45,000 miles, or a little more than one seventh of the former. For our present calculation, however, we will assume 200,000 miles for the life of a steel wheel, and 40,000 for that of a chilled wheel. We will also assume that each wheel will run 30,000 miles per annum, and that the time consumed in changing a chilled wheel is equal to the time consumed in turning a steel wheel, the locomotives remaining idle the same length of time in each case; and also that the cost of turning the steel wheel and of replacing the worn-out iron wheel is the same—say $5 for each turning and each change. As compounding the interest only complicates the question without materially affecting the results, we will charge each wheel with simple interest only, or six per cent upon cost until the 200,000 miles have been run.

With an annual mileage of 30,000 miles, the life of a steel-tired wheel will be 6⅔ years, during which time it will require two turnings, keeping the locomotive idle two days. The cost, for a run of 200,000 miles, may then be estimated as follows:

Cost of wheel	$45 00
Interest on same, 6 yrs. 8 mos.	18 00
Two turnings, removals and replacings	10 00
Two days' interest on cost of engine	4 60
	$77 60
Deduct value of old wheel	7 00
	$70 60

The estimate of your correspondent of the cost of a steel wheel running 300,000 miles, at the rate of 15,000 miles per annum, is as follows:

Cost of 1 steel wheel	$50 00
Deterioration, 40 cents a year	8 00
Two turnings, $1 each	2 00
Interest 7 per cent compounded every 3 years	135 48
	$195 48

It will readily be seen that on a basis of 200,000 miles for each wheel, the difference in cost is very much in favor of the one first named, or the $45 wheel; and in this connection, the writer would say that he will gladly contract to furnish steel-tired wheels at this price, and guarantee a satisfactory mileage.

The cost of chilled-iron wheels for the same period, assuming the life of each to be 40,000 miles, and the annual mileage of each 30,000 miles, will be $147.60, or $112.60, after deducting the value of five old wheels. The items may be tabulated as follows:

Cost of first wheel	$20 00	
1⅓ year's interest on same	1 60	
5⅓ " " " $13 00	4 16	
		$25 76
Cost of second wheel	20 00	
1⅓ year's interest on same	1 60	
4 " " " $13 00.	3 12	
		$24 72
Cost of third wheel	20 00	
1⅓ year's interest on same	1 60	
2⅔ " " " $13 00	2 08	
		$23 68
Cost of fourth wheel	20 00	
1⅓ year's interest on same	1 60	
1⅓ " " " $13 00	1 04	
		$22 64
Cost of fifth wheel	20 00	
1⅓ year's interest on same	1 60	
		$21 60
Total cost of 5 wheels		$118 40
Add 4 days' interest on cost of engine		9 20
Cost of four changes		20 00
		$147 60
Deduct value of 5 old wheels		35 00
		$112 60

This shows a difference in favor of the steel wheel of $42 on a mileage much below its average life; while we have credited the chilled wheel with a mileage fully up to its average in locomotive service. In making these comparisons, we think we have treated each wheel fairly, and can see no reason for adding to the cost of either, the interest on machinery, as your correspondent has done.

We would say further, in regard to this subject, that if railway companies were only willing to pay as much for steel-tired wheels, taking into account their superior capacity and longer life, as they actually do for chilled-iron wheels with their comparatively small mileage, a style of steel wheel could be produced that would defy all competition. It is well known that the chilled wheels of the present day are very inferior in quality. This is due either to the use of inferior iron, or to the admixture and recasting of old wheels; and although we have conceded to them in our estimates a mileage of 40,000, we believe this to be considerably above the actual average. It is no uncommon thing to see wheels of this description that are otherwise good thrown out of use for imperfections or soft places in the tread, although they may not have run 5000 miles. These defects can not be discovered without a trial on the track. They have never been known to occur with the steel wheels.

Your correspondent admits that the steel wheel is the strongest and less liable to break. The defects of chilled wheels can easily be demonstrated by an inspection of scrap-heaps; spongy places can only be detected by turning off the skin. Wheels, by the continued use of chills, are liable to become deformed or not perfectly round, and this causes them to flatten, and when there is a flat place on the tread, the wheel will almost always stop at that place. Wheels with blotches on them certainly tend to shorten the life of rails, and also to communicate their defects in one way or another to their mates.

I shall be glad if this brief communication will aid in securing for this subject the attention it deserves, as it directly concerns the economical operation of railroads in one of its most important features. Facts, and facts only are what are wanted; and should any inquiries be made in regard to any of the foregoing statements, by parties writing over their own proper signatures, I shall take pleasure in replying to them.

Yours, etc., JOHN K. SAX.

PITTSTON, PA., May, 1875.

A Few Suggestions for the Convention.

To the Editor of The National Car-Builder:

DEAR SIR: Permit me, through the columns of your journal, to offer a few suggestions, or rather expressions of opinion, in reference to the annual convention of the Car-Builders' Association which is soon to be held in your city. A glance at the list of committees appointed last year indicates the nature of the topics to be discussed. Every car-builder has an interest in these discussions, and is bound to participate in them to the extent of his experience and ability. We fear, however, that there are members of the Association who do not fully realize the obligations they are under in this respect. Their names do not appear in the record of proceedings except as being present at the call of the roll, or as members of committees, or perhaps as making some casual motion of no special importance. They have ideas and opinions upon every subject under discussion, but do not give them expression. They say they do not come to speak, but to listen and learn; and those who say this are not the younger and inexperienced class of members, but among them are many who have grown gray in the service. Is there no way of bringing out these silent ones so that the knowledge they possess, derived from observation and long experience, may be made available?

It would doubtless make the discussions more profitable, and force members to participate in them more generally, if the "class-meeting" practice were adopted, and each one called upon individually to give his experience, especially upon matters of vital importance. Many in this way would overcome their natural diffidence, and become good talkers before they were aware of it. There would then be less fault-finding and criticism after the work of the convention is over; for this kind of dissatisfaction is usually confined to those who have the least to say during the regular sessions. It is to be hoped, Mr. Editor, that the notion of going to the convention merely to listen and learn will be modified somewhat by recognizing the reciprocal obligation to communicate and instruct, an obligation which rests equally upon all, and which can not be evaded without impairing the usefulness of the association in a corresponding degree. The dispatch of business would be greatly facilitated if the reports of committees could be printed in advance and placed in the hands of members so they could be read and digested before their formal presentation in convention. A time should then be fixed for the discussion of each report, and the members designated who are to take the lead. Something of this kind has already been suggested by the Secretary of the Master Mechanics' Association, with reference to the mode of proceeding at the annual meetings of that society. The necessity of adopting the most effective means of economizing time is obvious, in view of the shortness of the sessions and the numerous subjects to be considered. The writer very well remembers that during the session of the car-builders' convention last year at Cincinnati, a report upon an important subject was presented by a committee, and after being read, a prolonged and painful silence followed, which was at length broken by a young and inexperienced member, lest some mischievous wag might start the report that a Quaker meeting was under way. The older heads followed, one after another, until the discussion became quite animated, the uniformly and inveterately silent ones, of course, not participating. They were busy, nevertheless, in appropriating whatever valuable information was disclosed, and doubtless talked the matter over very freely when they reached home.

There is another matter, Mr. Editor, I would like to allude to in this connection as possibly entitled to some claim upon the attention of the convention. My observation as a Western man leads me to the belief that there is less unity of views among Western car-builders than among those at the East. This doubtless arises from the fact that there is more concentration and greater facilities of intercourse and communication in the latter section than in the former. The monthly meetings which have been held at the rooms of the Association in your city for two or three years past, have doubtless done much to reconcile conflicting views, and make the car-builders who attend them better acquainted with each other as well as with manufacturers, inventors, scientific men, and others who take part in the discussions. At the Boston convention two years ago, a committee was appointed to consider and report upon the propriety of opening similar rooms at other railway centres, but, so far as I am aware, no report has yet been made upon the subject. There may be, and doubtless are, objections of a financial nature to the opening of such rooms at points like Chicago, Cincinnati, and St. Louis; but could their maintenance be provided for, and regular meetings held, it would be a great advantage to Western car-builders who can not, on account of the distance, attend the monthly meetings in New-York.

FRONTIER.

End-Play of Journals.

To the Editor of the National Car-Builder:

DEAR SIR: The last issue of your paper contains some comments by Mr. Reuben Wells, the master-mechanic of the Jeffersonville, Madison, and Indianapolis Railroad, in regard to certain defects in the construction of cars. With what he says respecting the draught arrangement, including timbers, draw-bars, links, pins, etc., I heartily concur. What he says also in regard to the use and application of springs, is especially valuable to car-builders, and particularly to beginners, who will be able to see why the car-body becomes wrenched and twisted after four or five years of service.

I can not altogether accept his views, however, in regard to the end-play or lateral motion of journals. The size he recommends ($3\frac{1}{2} \times 7$) is approved by my experience as a good one ; but I think they should have as much lateral play as the wheels have on the rails (which is usually $\frac{1}{2}$ an inch), otherwise the strain will be hard on the truck-frame, and for the following reasons :

1. The box patterns would have to be made very heavy to last the life of a car. Those of the ordinary weight would doubtless have to be replaced several times, or else the wheels would have more lateral motion than necessary. Both the boxes and wheel-hubs would also have to be faced off, which would cause considerable expense.

2. The additional friction surface which would attend the method recommended by Mr. Wells, would, according to my estimate, be 68 square inches to a car more than a collar $\frac{7}{16}$ deep would have on a $3\frac{1}{2}$ inch journal ; that is, taking a wheel-hub $7\frac{1}{2}$ inches diameter with $4\frac{1}{2}$ inch wheel-seat.

3. The truck-frames would be much more liable to get out of square ; for, in going round a curve, both wheels will press against the outer rail, until the lead-wheel receives a jar, or the inside one slides back, thus oscillating them to the other side. This, when running at high speed, will tend to knock the frame out of square, as the shock will be against opposite boxes ; whereas, if the boxes, brasses, keys, and frame are constructed in such a way as to receive the shock on the inside collar at one end, and on the outside collar at the other end of the same axle at the same time, such tendency would be very much lessened.

My opinion is, that if a collar $\frac{7}{16}$ deep is properly turned up, with the box, brass, and key patterns rightly calculated, an 8 or even 9 pound brass will wear out while the end-wear of the same will not, at the most, exceed $\frac{5}{8}$ of an inch. Whenever I have taken them out with the ends worn more than this, it has been on collars $\frac{1}{4}$ inch deep, or else turned up so square as to form a tool for cutting away the brass. Some may question the expediency of giving the wheels as much lateral motion in the frame as they have on the rails, and ask why compromise cars do not require it. I have always noticed that the truck-frames of these cars are, as a rule, much more loose than those intended for only one gauge.

In what I have said I do not wish to be understood as underrating the opinions of others who may have given these points more thought than I have, aided by longer and larger experience. But as I am engaged in the building and repairing of cars, I desire to obtain such information as will best promote my own as well as the interests of my employers. If in what I have said I have been laboring under a wrong impression, I hope I shall be corrected by some of your many readers whose observation and experience are better than my own.

JAMES G. THAYER.

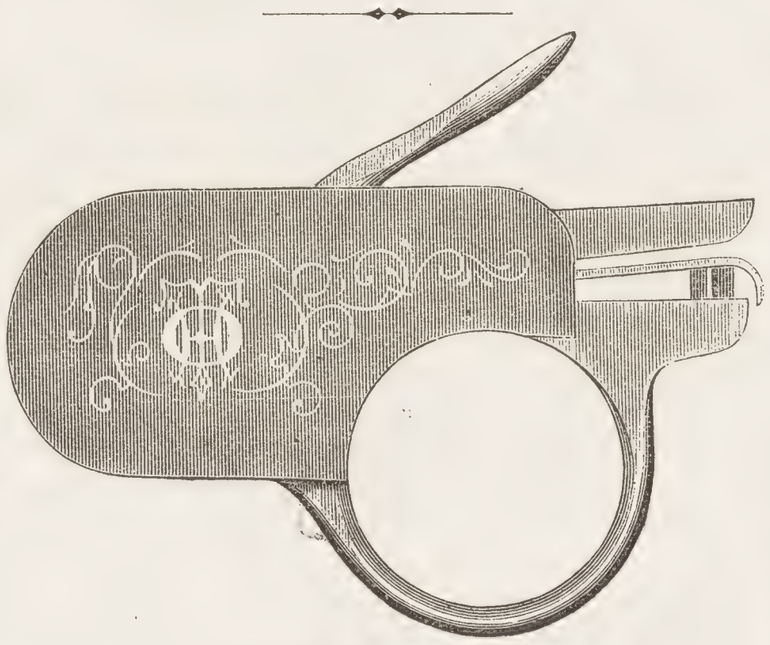
ATCHISON, KANSAS, May, 1875.

New Drawing-Room Coaches.

FOUR new drawing-room coaches have just been added to the rolling-stock of the Delaware, Lackawanna and Western Railroad. They were built at the companies' shops, at Scranton, Pa., and under the supervision of Mr. Robert McKenna, the master car-builder of the road. They are named "Richfield," "Pocono," "Delaware" and "Binghamton" respectively, and are all of the same size, construction, and finish, so that a description of one will suffice for all. We had the pleasure of inspecting the first-named car a few days since at Hoboken. It is in all respects a very elegant and beautiful specimen of a drawing-room coach, being replete with all the requisites for luxurious traveling, with no excessive embellishment for mere effect, as is too often the case with this class of cars.

The "Richfield" is 50 feet long over end-sills ; 9 feet 6 inches wide over side-sills ; 7 feet 8 inches high from bottom of sill to top of crown-moulding, and 9 feet 4 inches from floor to centre of head-lining. The trucks are the four-wheeled standard pattern with "M. C. B." standard axles. There are four check-chains to each truck. The springs are combination elliptics, in which the elastic properties of steel and rubber are utilized to the best advantage. The car is equipped with the Vacuum brake, which seems to be growing in popularity as a reliable, effective, and economical device. The interior contains a central saloon with 16 revolving chairs and a lounge upholstered in crimson plush. Adjoining this is a private parlor seating 8 persons, and opening on a side passage ; between this and the end of the car are closets, lavatory, and a Baker Heater. At the other end are two side rooms, with seating capacity for 4 persons each. The finishing throughout is in black-walnut with raised panels of French burl, and cedar mouldings, all executed in the best style of cabinet-work and presenting a rich and elegant appearance. There are six windows on each side, with plate glass 38 x 32. Wire-cloth screens can be inserted when the windows are raised. The car is lighted with four of Westlake's centre chandeliers ; mirrors, scroll-work, nickel-plated basket-racks, and other accessories, complete the interior decoration. The prevailing colors of the head-linings and carpets harmonize with each other and with the upholstery. The arrangements for ventilation consist of Creamer's ventilators in the roof, and pivoted windows at each end over the door, the rear one remaining closed while the car is in motion, the air being admitted through wire screens under the hood outside. The side-lights in the roof are also protected by screens on the outer side. The exterior of the car-body is a maroon color relieved with gilt striping.

These coaches commenced running on the first of May, and will be a great convenience to summer travelers, and especially to the large and increasing numbers who are attracted every season to the mountain regions of Pennsylvania, and the charming scenery of the Delaware Water-Gap.



Improved Ticket-Punch.

THE engraving illustrates an improved ticket-punch for the use of conductors. The improvement consists in the compact form of the instrument, the facility with which it can be used, and its capacity of being worn on the finger with no inconvenience while the conductor is making change, writing, etc. The cut is full size, and shows the construction and method of using so clearly as to require little explanation. The case containing the mechanism is of one piece with the ring and punch-base. The forefinger being placed in the ring so that the mouth or jaws of the punch point outward and the case inward, the lever is brought in position to be pressed by the thumb which brings down the jaw and punches the ticket. The device is an ingenious one, and is said to give entire satisfaction to conductors who have tested it. The inventor and patentee, Mr. O. T. Hungerford, New-Hartford, Ct., may be addressed for further particulars.

THE Putnam Machine Company of Fitchburg, Mass., lately shipped one of their machines for boring car wheels to the Vermont Central Railroad Company, at St. Albans, Vt. The machine weighs nearly four tons. A similar one was lately sent to Texas.

MR. WM. H. HATHAWAY, foreman of the car-shops of the Toledo, Wabash and Western Railway, died April 18th. He had been in the service of the road from the time it was first built.

IN stirring his fire, the fireman on a French locomotive found a human foot in his ash-pan, and that was the first intimation they had that they had killed a man some hours before.

THE Iron and Steel Institute of Great Britain has elected Mr. Peter Cooper, of New-York city, as an honorary member.

IF talk were grain elevators and terminal accommodations, New-York City would to-day have storage room and shipment facilities for the commerce of the entire continent.—*Pittsburg Commercial.*

If talk, in like manner, were rapid transit, horse-cars would now be known only as antique relics, time and space would have no practical existence on Manhattan Island, no modern New-Yorker could distinguish between up-town and down-town, and Wall-street and Westchester county would be synonymous terms.

Facetiæ.

A CITY horse-car, ascending a steep grade, refused to stop when hailed by a gentleman from the side-walk, until it had reached the summit. The gentleman, out of breath and temper also, got on the car, and addressed the conductor as follows : "Sir, I supposed this road was run for the accommodation of the public." "You never were more mistaken in your life," replied the conductor. "It's run in order to fill the stockholders' pockets." "Indeed," said the now irate passenger, "I thought all the conductors on this road were gentlemen." "Worse than before," said the conductor. "Do you suppose I would run a horse-car if I was a gentleman?"

"How shall I advertise?" asked a timid merchant of his more enterprising neighbor. "How? why, *advertise*—do it, go it, make a break—you are not advertising while you are asking 'how,' and while you ask how, somebody else is taking in the custom. *Start*—that is the main point ; you will soon get into doing it the right way ; while if you act as some folks do, and ask 'how' to day and 'how' to-morrow, and keep up asking to the end of your days, you will never advertise at all, and very likely never be worth a cent."

BUSINESS seems to be dull in San Antonio, Texas, just now. The *Herald* says : "Times are so hard that, when the boy who goes out on Saturday to collect bills for a leading dry-goods establishment comes home with seventy-five cents, and has the ceiling of his pants worn out by the boots of the customers from whom he has collected it, the proprietor regards it as a good day for collections."

A POLICEMAN met a negro at night carrying a trunk along the street, and collared him. The negro explained, "De family what was boarding me has been axing for money, and as dey was gone out to-night I thought I would git into some family whar dey respected de panic."

AN honest old gentleman from a rural county, who came down to New-York to spend the Sabbath with friends, was asked by one of them what the people up his way thought of the Beecher scandal. He replied that he never tried it, and didn't know any thing about it—that he and all his neighbors burned kerosene.

NEEDHAM'S
Safety Signal Light,
FOR
PREVENTING REAR COLLISIONS.

Shows in both directions whether the train is moving fast, or slow, or stopped.

In cases of trains uncoupling it is superior to the *"Block System,"* and for safety to trains following, it is the *Best Light in Use,* indicating by the simplest mechanism, both speed and distance.

CARS EQUIPPED FOR TRIAL FREE.

ADDRESS,

WM. L. NEEDHAM,

No. 81 Hicks St., W. S.,

CLEVELAND, O.

W. LOUGHRIDGE'S AIR BRAKE,

Adopted by and about three years in use on the Baltimore and Ohio Railroad and connecting lines, the Western Maryland, and others, nearly 2500 miles.

The cost to equip and maintain this brake is about fifty per cent less, and its general effectiveness for stopping quickly for emergencies and general purposes is much greater than any other device of its class now claiming railway patronage. Rights for sale at a very low royalty per mile of road, thus enabling all companies to equip their trains and make repairs at their own shops.

Box 477, Baltimore, Md.

WANTED,
A LOCOMOTIVE, WOOD-BURNER,

Weighing 18 to 20 tons.

Must be in good order. Give maker, when built, and description. Address,

G. G. & P. G. R. R.,
Port Gibson, Miss.

Railroad Cars for Sale.

TWO PASSENGER CARS

Capable of Seating Forty Persons,

But little used, and in perfect order. Patent Trucks, Brakes, etc.; have been used in Druid Hill Park only. Built by Grice & Long, of Philadelphia. Would suit a Dummy Engine.

PRICE, $400 EACH.

BOWEN & MERCER,

65 South Gay St., Baltimore, Md.

Or, F. S. LINCOLN, 39 Dey Street, New-York City.

Read Advertisement of
BRIDGES' LUBRICATOR,
Page x.

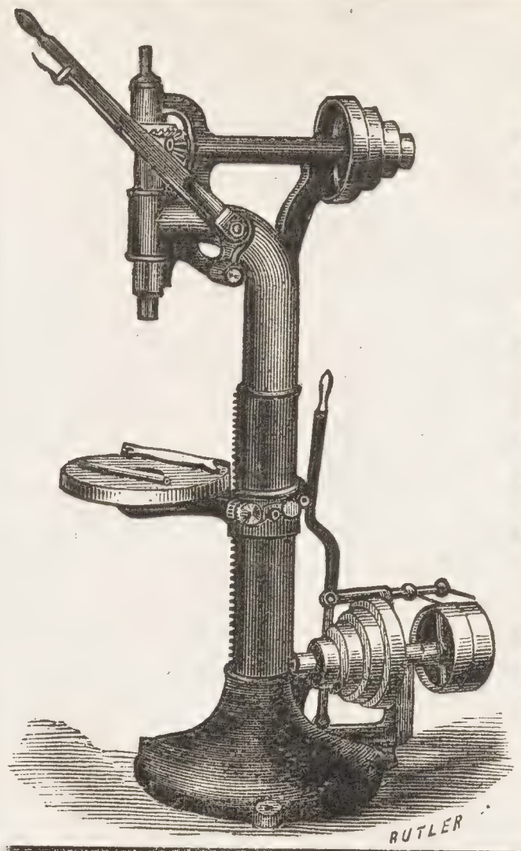
Established 1858.



TRADE MARK PATENTED.

The best and cheapest Paint in the world for Iron, Tin or Wood. For sale by the Trade everywhere. PRINCE'S METALLIC PAINT CO., Manufacturers, 96 Cedar St., New York.

CAUTION.—Purchasers and consumers are cautioned against imitations of our METALLIC PAINT. All genuine *PRINCE'S METALLIC PAINT* will bear our name and trade mark on each and every package. Send for a circular.

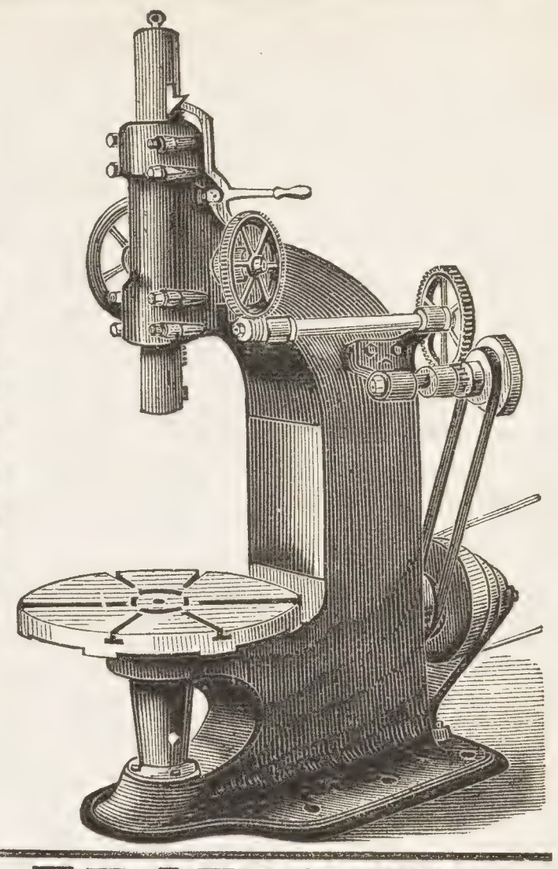


EDWIN HARRINGTON & SON,

Manufacturer of **ENGINE LATHES,** from twelve (12) to forty-eight (48) inches swing; **Hand Lathes; Wood Turning Lathes; Vertical Drills; Boring Mills; Tapping and Centring Machines; Screw Press** for Mandrels; **Grindstone Boxes.**

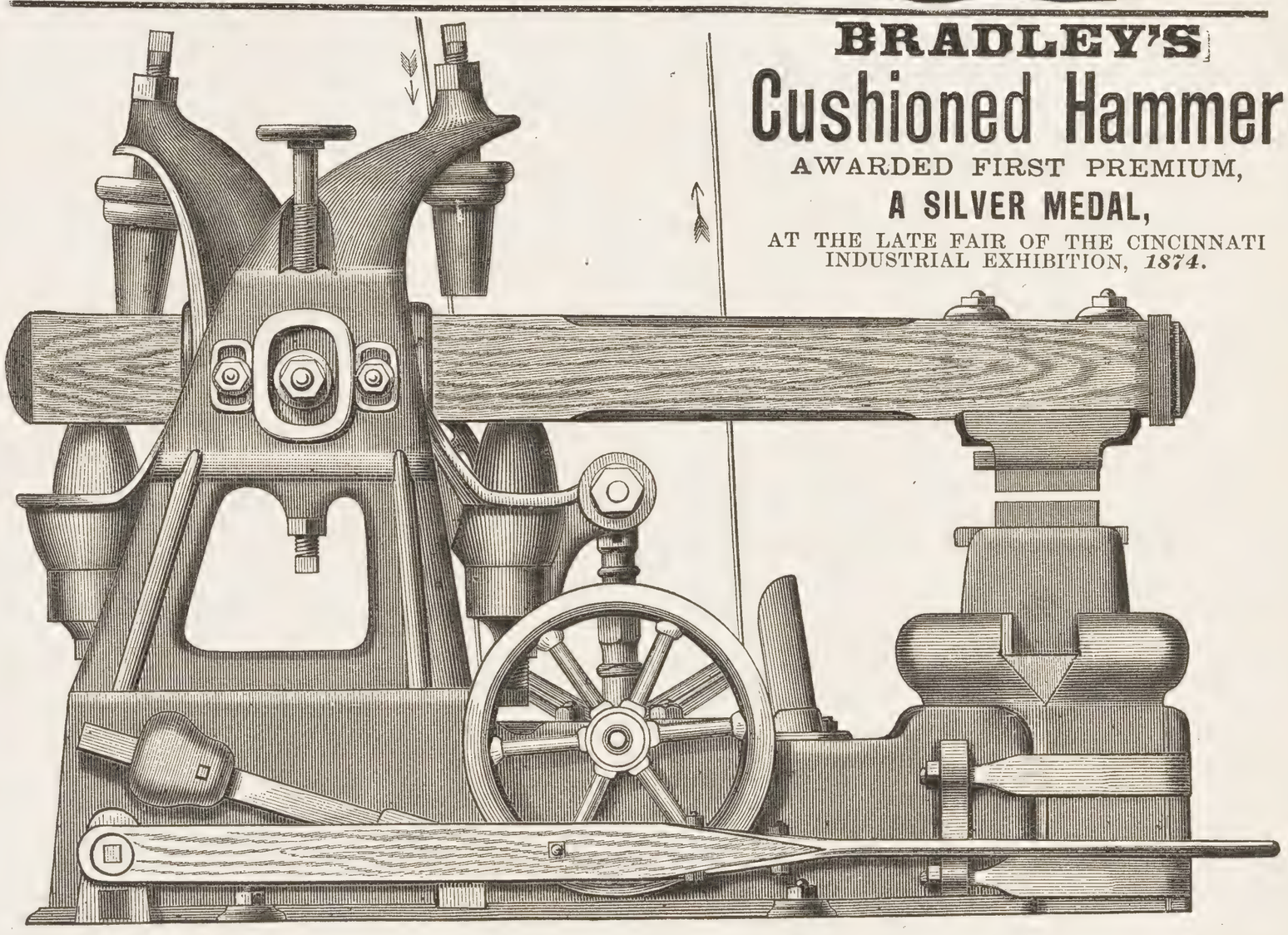
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PHILADELPHIA.



BRADLEY'S
Cushioned Hammer

AWARDED FIRST PREMIUM,
A SILVER MEDAL,
AT THE LATE FAIR OF THE CINCINNATI INDUSTRIAL EXHIBITION, *1874.*



This Hammer has many valuable improvements made useful in the device for cushioning the blow, thereby relieving all the working parts from that jar and concussion which is the destroying element of other helve hammers. It is made

Adjustable in Line of Action, Length of Stroke Rapidity of Motion, and Weight of Blow,

all of which are controlled at the will of the operator. They have

Larger capacity, cost less, are more durable, take up less room, do more and better work at less expense for power than any other Hammer in use.

We guarantee them fully as recommended. For particulars, address

BRADLEY MANUFACTURING CO., Syracuse, N. Y.

BUERK'S WATCHMAN'S TIME DETECTOR.

Important for all large corporations and manufacturing concerns; capable of controlling, with the utmost accuracy, the motions of a watchman, as the same reaches different stations of his beat. Send for Circular.

J. E. BUERK,

P. O. BOX 979,

84 Washington St., Boston, Mass.

N. B.—In the suit against *Imhaeuser & Co.*, a decree was given, June 10th, 1874, granting an injunction against them, and awarding an account of damages for infringing on the Patent of Buerk's Watchclock. The public is hereby cautioned not to purchase Watchman's Time Detectors infringing on Buerk's Patents.

In sending for Circular or ordering the above, please mention this paper.

Car Manufacturers.

Allison, W. C. & Sons.....Philadelphia Pa.
Allegheny Car & Transportation Co.....Swissvale, Pa.
Altoona Manufacturing Co .. ..Altoona, Pa.
Adrian Car Co .. ..Adrian, Mich.
Arlington Car Manufacturing Co. .....Arlington, Vt.
Barney & Smith Manufacturing Co.....Dayton, Ohio.
Baker, Jackson & Co.....Latrobe, Pa.
Bellefonte Car Manufacturing Co. .....Bellefonte, Pa.
Billmeyer & Smalls..... .....York, Pa.
Bradley, Osgood..... .....Worcester, Mass.
Bridgeport Car-Works.....Bridgeport, Pa.
Brill, J. G. & Co.....Philadelphia, Pa.
Buffalo Car Co..... .....Buffalo, N. Y.
Canada Car Co..... ..... Toronto, Canada.
Canda, F. E. & Co..... ..... Chicago, Ill.
Cape Fear Building Co..... .....Abbottsburg, N. C.
Cartersville Car Co .....Cartersville, Ga.
Central Car & Manufacturing Co.....Jackson, Mich.
Clendenning, W. W..... .....Montreal.
Cummings Car-Works.....Jersey City, N. J.
Connellsville Machine and Car Co.....Connellsville, Pa.
Corunna Car Co.....Corunna, Mich.
De Pere Iron-Works.....De Pere, Wis.
Detroit Car-Works.....Detroit, Mich.
Dawson Manufacturing Co.....Dawson, Ga.
Dickey, Neill & Co.....Toronto.
Dickson Manufacturing Co.....Scranton, Pa.
Erie Car-Works.....Erie, Pa.
Elmira Car-Works.....Elmira, N. Y.
Frederick & Co.....Catasauqua, Pa.
Freas Brothers & Thornton.....Berwick, Pa.
Gardner, F. & Co..... .....Carlisle, Pa.
Gill, John L.....Columbus, Ohio.
Gilbert, Bush & Co..... ..... Troy, N. Y.
Goold, James & Co..... Albany, N. Y.
Goodrich Car Co..... .....Augusta, Ga.
Hannibal Car Works.....Hannibal, Mo.
Harris, J. & Co.. .....St. John, N. B.
Harrisburg Car Manufacturing Co.....Harrisburg, Pa.
Haskell & Barker Car Co.....Michigan City, Ind.
Heathcote, Herbst & Co..... ...Glen Rock, Pa.
Hamilton, William & Son .....Toronto.
Harlan & Hollingsworth Co.....Wilmington, Del.
Herrick Car-Works... .....Oswego, N. Y.
Huntingdon Car-Works.....Huntingdon, Pa.
Indiana Car Co... .....Cambridge City, Ind.
Jackson & Sharp Co.....Wilmington, Del.
Jackson & Woodin Manufacturing Co....Berwick, Pa.
Jones, J. M. & Co.....West-Troy, N. Y.
Kimball Manufacturing Co.....San Francisco, Cal.
Keith, H. T. & I. N.....W. Sandwich, Mass.
Laporte Car Manufacturing Co.....Laporte, Ind.
Lombard, Thomas.....Augusta, Me.
Lebanon Manufacturing Co.....Lebanon, Pa.
Lehigh Car Manufacturing Co.....Stemton, Pa.
Litchfield Car Manufacturing Co.....Litchfield, Ill.
Mansfield Machine-Works.....Mansfield, Ohio.
Michigan Car Co..... .....Detroit, Mich.
McNairy, Claflen & Co..... .. Cleveland, Ohio.
Murray, Dougall & Co.....Milton, Pa.
McVay, Walker & Co.....Braddock's Field, Pa.
Mowry Car and Wheel Works..... ..Cincinnati, O.
Middletown Car & Manufacturing Co.....Middletown, Pa.
Missouri Car and Foundry Co.....St. Louis, Mo.
Myers, H. S. & Co. (small cars).....York, Pa.
National Car Co..... .. ..St. Albans, Vt.
New-Haven Car Co..... .....New-Haven, Ct.
Niblo, James M.....Conshohocken, Pa.
Ohio Falls Car Co..... ....Jeffersonville, Ind
Ontario Car Co... ....London, Ont.
Oxford Co-operative Car Co..... .. ..Oxford, Pa.
Patten Car-Works.....Bath, Maine.
Peabody & Crangle Bro's .....Calais, Me.
Peters, Simon.....Quebec.
Petersburg Car Co... .....Petersburg, Va.
Pittsburg Car-Works.....Pittsburg, Pa.
Pittsburg and McKeesport Car Co.....McKeesport, Pa.
Pittsburg Car and Locomotive Co .....Pittsburg, Pa.
Portland Co..... .....Portland, Me.
Pullman Car Co.....Chicago and Detroit.
Peregoy, J. H..... .....Houston, Texas.
Ranlet Car Manufacturing Co.. .....Laconia, N. H.
Russell & Co.....Massillon, Ohio.
Sands, William L.....Pottstown, Pa.
Schall, Michael..... .....York, Pa.
Schenectady Car-Works.....Schenectady, N. Y.
Shaaber & Johnston .....Reading, Pa.
South-Western Car Co.....Jeffersonville, Ind.
Shoenberger & Bryant..... .....Duluth, Minn.
Seath & Hager..... .....Terre Haute, Ind.
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Stephenson, John & Co..... ..... New-York, N. Y.
Star Mining & Manufacturing Co.....Henderson, Ky.
Taunton Car Co.....Taunton, Mass
Tredegar Co .....Richmond. Va.
Watsontown Car Co.....Watsontown, Pa.
Wharton, Thomas J.....Brunswick, Ga.
Whittaker, Phillips & Co..... .....Toledo, Ohio.
Wason Manufacturing Co.....Springfield, Mass
Weimer, P. L. & Bros.....Lebanon, Pa.
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Wells, French & Co..... ...Chicago, Ill.
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Atlantic Iron-Works..... ...Portsmouth, Va.
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Barnum Richardson Co.....Lime Rock, Conn.
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Bass & Hanna..... ... Fort Wayne, Ind.
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Cayuta Wheel & Foundry Co., ...Waverly, N. Y.
Chicago Car-Wheel Co.....Chicago, Ill.
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Hamtramck Car-Wheel Works... .....Detroit, Mich.
Harris, J. & Co..... ....St. John, N. B.
Harrisburg Car Manufacturing Co.....Harrisburg, Pa.
Haskell & Barker Car Co .....Michigan City, Ind.
Heartt, Jonas S. & Co.....Troy, N. Y.
Jackson & Woodin.....Berwick, Pa.
John L. Gill..... .....Columbus, Ohio.
Lehigh Car-Wheel & Axle Works..... Catasauqua, Pa.
Litchfield Car M'f'g Co..... .....Litchfield, Ill.
Lobdell Car-Wheel Works.....Wilmington, Del.
London Car-Wheel Co..... .....London, Can.
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Missouri Car and Foundry Co.....St. Louis, Mo.
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Ohio Falls Car Co..... ....Jeffersonville, Ind.
Parker & Bailey.....St. Paul, Minn.
Pettengill, Glass & Co.....Cleveland, Ohio.
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Russell, B. F. & Co .... Chicago, Ill.
Rutland Foundry & Machine Co.....Rutland, Vt.
Sterling Car-Wheel Foundry..... .Columbus, Ohio.
Scoville, J. & N. C.....Buffalo, N. Y.
St. Louis Car-Wheel Co. ....St. Louis, Mo.
Taylor Iron Works.....High Bridge, N. J.
Thompson, Duglas..... Bordentown, N. J.
Tredegar Company..... .....Richmond, Va.
Toronto Car-Wheel Co..... ....Toronto, Can.
Washburn, Hunts & Co.....Jersey City, N. J.
Washburn Car-Wheel Manufacturing Co... ..Worcester, Mass.
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Woodbury & Company..... .....E. Cambr'ge, Mass.
Wyoming Valley Manufacturing Co..... ...Wilkesbarre, Pa.

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Mason, William.....Taunton, Mass.
McKay Iron and Locomotive Works.....Jersey City, N J.
Portland Company.....Portland, Me.
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Locomotive and Car Builders' Machinery a Specialty.

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Buffalo Steam Gauge & Lantern Co.

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LOCOMOTIVE HEAD LIGHTS,

TAIL LAMPS,

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DEALERS IN

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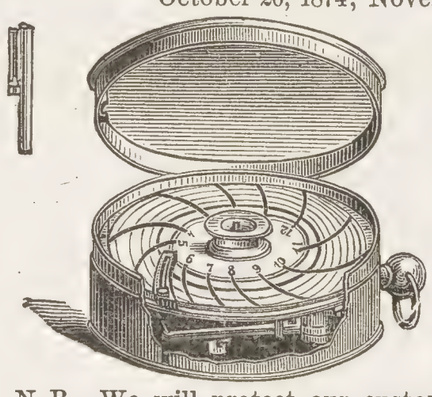
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BUFFALO, N. Y.

Reflectors Re-plated, Gauges of all kinds and Locomotive Balances Repaired at Short Notice.

WATCHMAN'S IMPROVED TIME DETECTORS.

U. S. Patents, December 28, 1869; April 22, 1873; August 2, 1874; October 20, 1874; November 10, 1874.



These Detectors are the latest and most complete invented. They are portable and reliable time-pieces and guaranteed in every case to be perfect. They can be cleaned and repaired by any watch-maker, and are invaluable and indispensable to all establishments that employ watchmen, as it enables them to check and control their movements. **Price,** with 12 keys (for 12 stations), **$75.**

N. B.—We will protect our customers against all claims of other patentees, and especially against J. E. Buerk, of Boston, Mass., who has never brought suit for any alleged infringement by clocks made under the above-named patents, and by us offered for sale. Send for Circular to

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212 Broadway, P. O. Box 4798, *NEW-YORK.*

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IMPORTERS AND DEALERS IN

Tin and Roofing Plates,

OF ALL SIZES AND KINDS.

Pig, Tin, Russia Sheet-Iron, Charcoal and Common Sheet-Iron, Lead, Sheet Zinc, Copper, Spelter, Solder, Antimony, Etc.

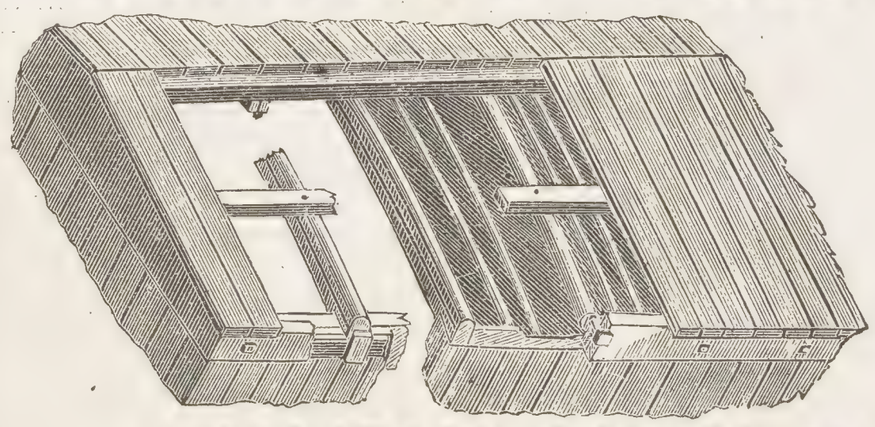
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Over 40,000 Cars now in service covered with this roof. It will last, without repairing, as long as the car it covers, and is more economical by one half than any roof in use.

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Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
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Alabama Central	E. M. Smith	E. M. Smith	Selma, Ala.
Albany & Susquehanna	R. C. Blackall	R. C. Blackall	Albany, N. Y.
Alexandria, Nebraska & Iowa	Geo. Q. Adams		Alexandria, Mo.
Arkansas Central	A. H. Johnson	A. H. Johnson	Helena, Ark.
Atchison, Topeka & Santa Fe	H. V. Farris		Topeka, Kan.
Atchison & Nebraska	Selah Williams		Atchison, Kan.
Alabama & Chattanooga	T. H. Kennedy		Chattanooga, Tenn.
Allegheny Valley	G. W. Glass	R. Gunning	Pittsburg, Pa.
Atlanta & Richmond Air-Line	G. H. Gramling		Atlanta, Ga.
Atlanta & West-Point	Wm. Rushton		Atlanta, Ga.
Atlanta & West-Point		R. D. Cole	Newnan, Ga.
Atlantic & Gulf	§Chas. Collins	P. N. Raynal	Savannah, Ga.
Atlantic & North-Carolina	E. J. Clayton	E. J. Clayton	New-Berne, N. C.
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Atlantic & Great Western	J. A. Cooper	††J. H. F. Wiers	Meadville, Pa.
Atlantic & Great Western	N. Wright	W. G. Huggard	Cleveland, Ohio.
Atlantic & Great Western		S. V. Smith	Kent, Ohio.
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Atlantic & Great Western	‖J. B. Miller		Shenango, Pa.
Atlantic & Pacific & Missouri Pacific	§§John Hewitt	J. Hodge	St. Louis, Mo.
Atlantic & Pacific & Missouri Pacific	‖R. D. Grant		St. Louis, Mo.
Atlantic, Mississippi & Ohio			
Norfolk & Petersburg Division	J. S. Whitworth	J. S. Whitworth	Norfolk, Va.
South Side of Virginia "	J. T. Robinett	J. T. Robinett	Petersburg, Va.
Virginia & Tennessee "	F. Sterk	W. A. Morgan	Lynchburg, Va.
Virginia & Kentucky "			
B			
Baltimore & Ohio	§John C. Davis	J. S. Shryack	Baltimore, Md.
Baltimore & Ohio	A. J. Cromwell	James H. Miller	Baltimore, Md.
Baltimore & Ohio	Wm. Edwards		Martinsburg, Va.
Baltimore & Ohio	S. A. Silver		Piedmont, Va.
Baltimore & Ohio	E. W. Lippencott.	H. Longest	Grafton, W. Va.
Baltimore & Ohio	E. L. Weisgarber.	‖C. Ditman	Wheeling, W. Va.
Central Ohio Division	Alex Platt		Zanesville, O.
S'dusky, Mans., & New'k Div.	Wm. Y. Johnson		Sandusky, O.
Central Ohio Division	§Sam. Houston		Newark, O.
Central Ohio Division	James Stewart		Newark, O.
Central Ohio Division	O. B. Perkins		Columbus, O.
Chicago Division	Geo. Wilson		Chicago, Ill.
Bangor, Old Town & Milford	J. B. Peckham	John H. Brown	Bangor, Me.
Bangor & Piscataquis	Horace Penny	J. W. Comins	Old Town, Me.
Bellefonte & Snow-Shoe	H. D. Landis	H. D. Landis	Bellefonte, Pa.
Belvidere & Delaware	R. McDowell	John Silvers	Lambertville, N. J.
Boston & Albany	Wilson Eddy	F. D. Adams	Springfield, Mass.
Boston & Albany	A. B. Underhill		Boston, Mass.
Boston & Albany		W. E. Chamberlain	Allston, Mass.
Boston, Barre & Gardner	John Loyer		Worcester, Mass.
Boston & Providence	George Richards	John Lightner	Roxbury, Mass.
Boston, Clinton & Fitchburg	John Webster	Samuel Stevens	Fitchburg, Mass.
Boston, Concord & Montreal	Ralph Adams	M. R. Elkins	Lake Village, N. H.
Boston & Maine	F. A. Waitt		Boston, Mass.
Boston & Maine		D. C. Richardson	Lawrence, Mass.
Boston, Lowell & Nashua	J. F. Crockett	T. G. Davis	Boston, Mass.
Boston, Lowell & Nashua		S. A. Davis	Nashua, N. H.
Brockville & Ottawa	H. J. Marshall	H. J. Marshall	Brockville, Can.
Brunswick & Albany	M. Thornton		Brunswick, Ga.
Burlington & Missouri River in Neb.	J. Christiansen	J. Christiansen	Plattsmouth, Neb.
Burlington, Cedar Rapids & Minn.	R. W. Bushnell	R. W. Bushnell	Cedar Rapids, Iowa.
Buffalo, New-York & Phila.	Allen Vail		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. J. Bookhammer.	John Monks	Oil City, Pa.
C			
Cairo & St. Louis	W. D. Macfarlane		E. Carondelet, Ill.
Cairo & Vincennes	Chas. H. Cory		Cairo, Ill.
California Pacific	A. J. Stevens	D. Rutherford	So. Vallejo, Cal.
Camden & Amboy	F. B. Stevens		Hoboken.
	T. T. Kerr	E. Lockwood	Bordentown, N. J.
	Thomas Single		South-Amboy.
Camden & Atlantic	Rufus Hill	S. Wills	Camden, N. J.
Canada Southern and Branches	‡‡C. E. Benton	††C. E. Benton	St. Thomas, Canada.
Carolina Central	W. A. Gill	Thos. Myers	Laurinburg, N. C.
Catawissa	Wm. Ellis	C. D. Ellis	Catawissa, Pa.
Catasauqua & Foglesville	Thomas Evans	Chas. J. Holbach	Catasauqua, Pa.
Central of Georgia	D. D. Arden	C. C. Millar	Savannah, Ga.
Central of New-Jersey	Wm. Woodcock		Elizabeth, N. J.
Central of New-Jersey	*T. W. Peeples	George Hackett	Elizabethport, N. J.
Lehigh & Susquehanna Div.	L. C. Brastow	L. C. Brastow	Wilkesbarre, Pa.
Central Branch Union Pacific	Geo. C. Benedict		Atchison, Kansas.
Central R. R. of Iowa		T. L. Seevers	Marshalltown, Iowa.
Central R. R. of Iowa	F. B. Woodruff		Eldora, Iowa.
Central Pacific	A. J. Stevens	Benjamin Welch	Sacramento, Cal.
Western Division	Geo. D. Welch	J. J. Lawler	Oakland Cal.
Visalia Division	S. Johnson		Lathrop, Cal.
Sacramento Division	M. W. Cooley		Rocklin, Cal.
Sacramento Division		Nat. Webb	Truckee, Cal.
Truckee Division	James Velsir	Wm. McPherson	Wadsworth, Nev.
Humboldt Division	H. L. Stevenson	H. B. Hartsman	Carlin, Nevada.
Salt Lake Division	W. H. McKenzie	G. J. Turner	Ogden, Utah.
California Pacific Division	D. Rutherford	D. Rutherford	Vallejo, Cal.
Central Vermont	J. M. Foss	J. M. Foss	St. Albans, Vt.
Harlem Extension Div.	C. S. Clapp	C. S. Clapp	Bennington, Vt.
New-London Northern Division	J. W. Dow	S. W. Caulkins	New-London, Ct.
Ogdensburg & L. Champlain Div.	William A. Short	J. R. Ames	Malone, N. Y.
Rutland Division	W. L. Short		Rutland, Vt.
Charleston & Savannah	H. T. Calder		Charleston, S. C.
Chesapeake & Ohio	W. G. Freeman	J. N. King	Richmond, Va.
Chesapeake & Ohio	§T. J. Hamer	H. C. Bassinger	Huntingdon, W. Va.
Cheraw & Darlington	D. W. Haines	A. M. Corrie	Florence, S. C.
Champlain Trans. Co	H. T. Calder		Burlington, Vt.
Cheshire & Ashuelot	F. A. Perry	F. A. Perry	Keene, N. H.
Charlotte, Columbia & Augusta	Robert King	J. C. Troeger	Columbia, S. C.
Chicago & Pacific	A. S. Gurnee		Chicago, Ill.
Chicago & Lake Huron			
Eastern Division	E. Hollis		Port Huron, Mich.
Western Division	W. C. Faulkner		Battle Creek, Mich.
Chicago & North-Western	§Geo. W. Tilton	William Campbell	Chicago, Ill.
Wiscon. Mad. & Mill. Divis		Wm. Campbell	Chicago, Ill.
Wiscon. Mad. & Mill. Divis		Henry Hull	Fond du Lac, Wis.
Galena Division		Hugh Gray	Chicago, Ill.
Iowa Division	C. C. Elliott	L. H. Preston	Clinton, Iowa.
Peninsula Division	Geo. White		Escanaba, Mich.
Chicago & Alton	John A. Jackman	R. Reniff	Bloomington, Ill.
Chicago, Burlington & Quincy	‡Wm. Wilson	††W. W. Wilcox	Aurora, Ill.
Galesburg Division	James Lamb	H. J. F. Small	Galesburg, Ill.
Creston Division	Joel West		Creston, Iowa.
Burlington Division	John Bassler		Burlington, Iowa.
Chicago, Clinton & Dubuque	P. R. Sutton		Dubuque, Iowa.
Chicago, Dubuque & Minnesota	P. R. Sutton		Dubuque, Iowa.
Chicago, Rock Island & Pacific	T. B. Twombly	B. K. Verbryck	Chicago, Ill.
Chicago & Michigan Lake Shore	T. J. Hartswell	D. Sutherland	St. Joseph, Mich.
Chicago, Danville & Vincennes	J. B. Morgan		Danville, Ill.
Chicago, Milwaukee & St. Paul			
La Crosse & P. Du Chien Div.		Wm. E. Kittredge	Milwaukee, Wis.
Northern Div.		John Bailie	Milwaukee, Wis.
Iowa & Minn. Div.	J. Pettee	J. Pettee	Minneapolis, Minn.
Hastings & Dakota Division	C. C. Clements.		Hastings, Minn.
Chicago & Iowa	H. S. Bryan		Aurora, Ill.
Cincinnati, Wabash & Michigan	E. M. Porter		Wabash, Ind.
Cincinnati, Hamilton & Dayton	James Eckford	W. H. H. Allison	Cincinnati, Ohio.
Indianapolis Division	Edward Moore		Indianapolis, Ind.
Cincinnati, Lafayette & Chicago	Charles E. Gore.		Lafayette, Ind.
Cincinnati & Muskingum Valley	Leroy Kells	Daniel Jewell	Lancaster, Ohio.
Cincinnati, Sandusky & Cleveland	J. M. Sanborn		Sandusky, Ohio.
Cleveland, Col., Cin. & Indianapolis	‡L. S. Young	††William F. Smith	Cleveland, Ohio.
Indianapolis Division	A. R. McAlpine		Galion, Ohio.
Indianapolis Division		R. Attridge	Indianapolis, Ind.
Cincinnati Division	D. Carmichael	D. Carmichael	Delaware, Ohio.
Columbus Division	F. G. Kaufholz	Wm. Cleve	Cleveland, Ohio.
Cleveland & Pittsburg	N. E. Chapman	A. Steinbrunner	Cleveland, Ohio.
Cleveland, Mt. Vernon & Delaware	J. W. Holloway	J. W. Holloway	Akron, Ohio.
Cleveland, Tuscarawas Val. & Wheeling	W. F. Turreff		Cleveland, O.
Cobourg, Peterboro & Marmosa	Wm. Polson		Cobourg, Canada.
Columbus, Chicago & Indiana Central	(See Pitts. Cinn. & St. Louis)		
Columbus & Hocking Valley	H. S. Wallace	H. S. Wallace	Columbus, Ohio.
Concord	Chs. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Portsmouth	C. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Claremont	J. N. Lander	A. Langmaid	Concord, N. H.
Connecticut River	§Wm. H. Stearns		Springfield, Mass.
Connecticut Valley	C. W. Hollister	N. A. Smith	Hartford, Ct.
Connecticut Western	N. Slingland.		Hartford, Ct.
Contoocook River			Concord, N. H.
Conn. & Passumpsic Rivers	Geo. Kilby		Lyndonville, Vt.
Corning, Cowanesque & Antrim	O. C. Patchell	O. C. Patchell.	Corning, N. Y.
Cumberland Valley	A. S. Hull	C. W. Nitterhouse.	Chambersburg, Pa.
Cumberland & Pennsylvania	W. L. Jordan	Nathan Binnix	Mt. Savage, Md.
D			
Dakota Southern	Jas. Whitney	A. A. Meckling	Yankton, Dak.
Danbury & Norwalk	Charles A. Craig.	C. A. Craig	Danbury, Ct.
Davenport & St. Paul	James Russell		Davenport, Iowa.
Dayton & Union	A. J. Keenan	J. F. Feicht	Dayton, Ohio.
Dayton & Michigan	John Black	W. H. H. Allison	Cincinnati, Ohio.
Delaware, Lackawanna & Western	Walter Dawson	Robert McKenna	Scranton, Pa.
Morris & Essex Division	W. H. Lewis	L. S. Barber	Hoboken, N. J.
Denver & Rio Grande	John Greenwood		Denver, Col.
Detroit, Ft. Wayne & Logansport	W. A. Carpenter.		Bankers, Mich.
Detroit & Milwaukee	C. M. Hanson		Detroit, Mich.
Detroit, Lansing & Lake Michigan	Tho. E. Roberts		Ionia, Mich.
Delaware & Hudson Canal Co.	‖‖R. C. Blackall		Albany, N. Y.
Dorchester & Delaware			Cambridge, Md.
Dubuque South-Western	James Rollo	James Rollo	Farley, Iowa.
Dutchess & Columbia	W. G. Vanbuskirk	H. A. Webster	Fishkill, N. Y.
Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett.	Dunkirk, N. Y.
E			
Eastern & Maine Central		J. P. Somerby	Salem, Mass.
Eastern & Maine Central	John Thompson		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L. Weaver	Riverton, Ky.
East-Tennesee, Virginia & Georgia	C. A. Hodge		Knoxville, Tenn.
Erie Railway	§§Frank K. Hain.		Susquehanna, Pa.
Erie Railway	Robert Wallace		Susquehanna, Pa.
Erie Railway	V. Blackburn		Jersey City, N. J.
Erie Railway	F. M. Wilder	M. Wilder	Buffalo, N. Y.
Erie Railway	J. W. Chapman	J. W. Chapman	Hornellsville, N. Y
Erie Railway	‖D. B. Goodell		Elmira, N. Y.
Erie Railway	‖J. B. Hill		Jersey City N. J.
Erie Railway	J. Van Vechten	‖J. Van Vechten	Port Jervis, N. Y.
Erie Railway	A. T. Back		Rochester, N. Y.
Erie & Pittsburg	G. J. Parkin.	G. J. Parkin	Erie, Pa.
European & North Am. (of Maine)	A. O. Bailey	J. H. Brown	Oldtown, Maine.
Evansville & Crawfordsville	John L. White	Joseph Stiker	Evansville, Ind.
Evansville, Terre Haute & Chicago	§§Wm. Riley, Jr.		Terre Haute, Ind.
F			
Fitchburg	Geo. A. Cooledge	Enos Varney	Charlestown, Mass.
Fitchburg & Worcester	John Webster	Samuel Stevens	Fitchburg, Mass.
Flint & Pere Marquette	Sanford Keeler	‖R. B. More	East-Saginaw, Mich.
Florida	Ezra Gray	G. Hernandez	Fernandina, Fla.
Flushing & North Shore	Wm. La Suer	C. Wilkinson	Hunter's Point, L. I.
Fort Wayne, Jackson & Saginaw		Lewis Colburn	Jackson, Mich.
G			
Galveston, Harrisburg & San Antonio	Palmer Cady		Harrisburg, Texas.
Galveston, Houston & Henderson	Jno. G. Coulon	Wm. Macbeth	Galveston, Texas.
Georgia	William Hardman.	T. M. Preval,	Augusta, Ga.
Gilman, Clinton & Springfield	W. B. McKenna		Springfield, Ill.
Grand Tower & Carbondale.	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk		Warren Noyes	Gorham, Me.
Grand Trunk	†Herbert Wallis	Wm. McWood	Montreal, Canada.
Grand Trunk			Sherbrooke, Can.
Grand Trunk		B. J. Mitchell	Portland, Me.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne, Ind.
Great Western of Canada	†Wm. A. Robinson.	F. Childs	Hamilton, Canada.
Green Bay & Lake Pepin.	J. H. Erwin.		Green Bay, Wis.
Greenville & Columbia	R. H. Anderson	R. H. Anderson.	Helena, S. C.
H			
Hackensack & New-York.	Abra'm Angausen		Hackensack, N. J.
Hanover Branch	John J. Bingley	Henry Britcher	Hanover, Pa.
Hannibal & St. Joseph	**Jno. MacKenzie		Hannibal, Mo.
Hartford, Providence & Fishkill	Edwin Garfield	V. D. Perry	Hartford, Ct.
Housatonic	C. R. Morris.	J. J. Ferris	Falls Village, Ct.
Houston & Texas Central	L. C. Noble	James McGee	Houston, Texas.
Houston & Texas Central		‖S. H. McElroy	Houston, Texas.
Huntington & Broad-Top Mountain	W. W. Coller	M. Tellerhoof	Saxton, Pa.
I			
Illinois Central	**S. J. Hayes	W. B. Snow	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia, Ill.
North Division	J. B. Edams		Amboy, Ill.
Iowa Division	Thomas W. Place		Waterloo, Iowa.
Illinois Midland	J. G. Clifford	G. Clifford	Paris, Ill.
Illinois & St. Louis.	James Hazen		Bellville, Ill.
Indianapolis, Cincinnati & Lafayette	J. S. Patterson	S. Griffith	Cincinnati, Ohio.
Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Indianapolis & St. Louis	A. J. Sanborn		Mattoon, Ill.
Indianapolis, Bloomington & Western	**H. L. Cooper	A. J. Allen	Urbana, Ill.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ia.
International & Great Northern	R. B. Small		Palestine, Texas.
Intercolonial	Wm. Whitney	Edw. Shaffer	Moncton, N. B.
Iron	Perry Scott	Clem. Roetling	Ironton, Ohio.
Ithaca & Athens	F. A. Brown.		Ithaca, N. Y.
J			
Jacksonville, Pensacola & Mobile	H. D. Kennedy		Jacksonville, Fla.
Jeffersonville, Madison & Indiana	Reuben Wells.		Jeffersonville, Ind.
Junction & Breakwater	J. A. Maguire.		Lewes, Del.
K			
Kalamazoo, Allegan & Grand Rapids			Kalamazoo, Mich.
Kansas City, St. Joseph & Council Bluff	Wm. D. Rowley	Wm. D. Rowley	St. Joseph, Mo.
Kansas Central	John Davis		Leavenworth, Kan.
Kansas Pacific	**L. H. Waugh		Wyandotte, Kansas.
Denver Pacific Div	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div.	**L. H. Waugh		Wyandotte, Kansas.
Junction City & Ft. Kearney Div	**L. H. Waugh		Wyandotte, Kansas.
Arkansas Valley Div	**L. H. Waugh		Wyandotte, Kansas.
Kentucky Central	J. R. Ledyard	J. L. Hackathorn	Covington, Ky.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Keokuk & Des Moines Valley	S. W. Wakefield	M. Sessions	Keokuk, Iowa.
King's Mountain	E. Thomas	E. Thomas	Chester, S. C.
Knox & Lincoln	§§E. R. Hamlin	Benj. Soule	Bath, Me.
Knoxville & Charleston			Knoxville, Tenn.
L			
Lackawanna & Bloomsburg	Chas. Graham	Chas. Graham	Kingston, Pa.
Lake Erie & Louisville	John Pero		Fremont, Ohio.
Lake Ontario Shore	Wm. Harris		Oswego, N. Y.
Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland, Ohio
Michigan Southern Division	Geo. W. Stevens		Elkhart, Ind.
" " "		S. S. Knapp	Adrian, Mich.
Toledo Division	J. M. Sanborn	Frank O. Bray	Norwalk, Ohio.
Erie Division	L. O. Gassett	J. Withyecombe	Cleveland Ohio.
Buffalo Division	W. L. Wallace	A. C. Robson	Buffalo, N. Y.
Lake Superior & Mississippi		John Hill	St. Paul, Minn.
Lehigh Valley	John I. Kinsey	E. R. Brown, Mauch Chunk, Pa.	South-Easton, Pa.
Lehigh Valley	P. Hofecker		Weatherly, Pa.
Lehigh Valley	John Campbell		Delano, Pa.
Lehigh Valley	D. Clark		Hazleton, Pa.
Leavenworth, Lawrence & Gal	J. S. McCrum		Lawrence, Kansas.
Little Rock & Fort Smith	D. R. Wing	D. R. Wing	Argenta, Ark.
London & Port Stanley			London, C. W.
Louisville, New-Albany & Chicago	Geo. Ruhlandt	Geo. Helfrich	New-Albany, Ind.
Long Island	Chs. A. Thompson	C. A. Thompson	Hunter's Point, L I.
Louisville, Cincinnati & Lexington	S. S. Pilson	S. S. Pilson	Louisville Ky.
Louisville & Nashville	†Thatcher Perkins		Louisville, Ky.
Louisville & Nashville	D. P. Rennie	Isaac M. Owens	Louisville, Ky.
Louisville & Nashville	Jas. Montgomery		Bowling Green, Ky.
Nashville & Decatur Division	John Skidmore		Nashville, Tenn.
South & North Ala. Div.	Thos Jeffers	W. L. Gude	Birmingham, Ala.
South & North Ala. Div.	C. H. Beale		Montgomery, Ala.
Memphis & Ohio Div.	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Louisville, Paducah & So. Western	W. D. Robb	Frank Looney	Elizabethtown, Ky.
M			
Macon & Augusta			Macon, Ga.
Macon & Brunswick	R. Wagnon	R. Wagnon	Macon, Ga.
Macon & Western	D. M. Gogel	James A. Knight	Macon, Ga
Maine Central	J. W. Philbrick	J. W. Philbrick	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div	John Ellis	C. H. Kenison	Augusta, Me.
Maine Central Division	John F. Merrill.		Waterville Me.
Manchester & Lawrence	Chas. L. Eastman.	M. W. Dickerman.	Concord, N. H.
Marietta, Pittsburg & Cleveland	W. J. Adams		Marietta, Ohio.
Marietta & Cincinnati	E. Bosley	E. Bosley	Chillicothe, Ohio.
Marquette, Houghton & Ontonagon	C. J. Shellhorn	H. D. Lyons	Marquette, Mich.
Maryland & Delaware	Samuel Peters		Greensboro, Md.
Memphis & Little Rock	Tho. Rennell	P. Twitchell	Argenta, Ark.
Memphis & Charleston	A. Ross	A W. Drew	Memphis, Tenn.
Memphis & Charleston	H. N. Burford	Fabien Varin	Huntsville, Ala.
Mineral Point	Robert Hay	Robert Hay	Mineral Point. Wis.
Mineral Range	C. H. Fox.		Hancock, Mich.
Mississippi & Tennessee	Geo. Haszinger	J. Riny	Memphis, Tenn.
Michigan Central	§§Geo. S. Chalender.	Geo. S. Chalender	Jackson, Mich.
Michigan Central		‖Henry Whiting	Detroit, Mich.
Midland Pacific	A. C. Stiles		Lincoln, Neb.
Mississippi Valley & Western	J. S. Pickering		Canton, Mo.
Missouri, Iowa & Nebraska	J. G. Crozier		Alexandria, Mo.
Missouri, Kansas & Texas	T. G. Gorman		Parsons, Kan.
Missouri, Kansas & Texas		J. Townsend	Sedalia, Mo.
Missouri, Kansas & Texas	J. E. Wiggins		Hannibal, Mo.
Missouri River, Fort Scott & Gulf	John S. McCrum	Alex. Montier	Kansas City, Mo
Mobile & Montgomery	James McFarland.	L. Barham	Montgomery, Ala.
Mobile & Girard	C. D. Wall		Girard, Ala.
Mobile & Ohio		John McHugh	Mobile, Ala.
Mobile & Ohio	R. McDougal	I. T. Booth	Whistler, Ala.
Mobile & Ohio	B. S. Herring		Macon, Miss.
Mobile & Ohio	R. H. Briggs		Jackson, Tenn.
Montgomery & Eufaula	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Algiers, La.
Montreal Northern Colonization	§§C. G. C. Simpson		Montreal, Can.
N			
Nashville & Chattanooga	John U. Eastman.	J. G. Sawyer	Nashville, Tenn.
Naugatuck	Henry Hanford	George W. Gray	Bridgeport, Ct.
New-Bedford	G W. Reynolds	Robert Chase	Taunton, Mass.
New-Brunswick	P. Logan	C. M. Kinnon	Fredericton, N. B.
New-Brunswick & Canada	Tho. Armstrong	G. Houlton	St. Andrew's, N. B.
New-Haven & Northampton	Henry Fox.	Henry Fox.	New-Haven, Ct.
New-Jersey Midland			Wortendyke, N.J.
New-Jersey & New-York	A. J. Auryansen		Jersey City, N. J.
New-Jersey Southern	Rufus Blodgett.		Manchester, N. J.
New-Orleans & Ohio	John R. Jordan	John R. Jordan	Paducah, Ky.
New-Orleans, St. Louis & Chicago	‡‡—— Allen.		McComb City, Miss.
New-Orleans, St. Louis & Chicago	§§L. H. Sellars		Water Valley, Miss.
New-Orleans, St. Louis & Chicago		G. H. White	McComb City, Miss.
New-Orleans & Mobile	§Josiah Bettis	W. J. Henderson.	Mobile, Ala.
New-York, Kingston & Syracuse	A. Q. Mackenbush	G. Dikeman	Syracuse, N. Y.
New-York & Harlem	Wm. M. Strong	C. E. Garey	New-York.
New-York Central & Hudson River		††Leander Garey.	New-York.
New-York Central Division	‡G. B. Van Vorst	D. Hoit	West-Albany, N. Y.
New-York Central Division	Henry Watkeys.		Syracuse, N. Y.
New-York Central Division	Amos Gould	James Leary.	Rochester, N. Y.
New-York Central Division	Jas. Butman	Wm. Johnson	Buffalo, N. Y.
New-York Central Division	S. L. White	George Rowe	Niagara Falls, N. Y
Hudson River Division	‡Wm. Buchanan.	E. A. Olmstead.	New-York City.
Hudson River Division	R. Greenalch	J. J. Conaghty	E. Albany. N. Y.
New-York, Boston & Montreal	W. G. Van Buskirk	H. A. Webster	Dutchess Junc., N.Y
New-York & Oswego Midland	§§W. A. Dripps		Oswego, N. Y.
Eastern Division	J. Minchell		Middletown, N. Y.
Middle Division	Tho. Howard		Norwich, N. Y.
Northern Division	Edward Van Vleck.	T. D. Day	Oswego, N. Y.
New-York & New-England	Geo. E. Boyden	Elias E. Pratt	Boston, Mass.
New-York, Providence & Boston.	Jas. H. Anderson.	Jas. H. Anderson.	Providence, R. I.
New-York, New-Haven & Hartford	§§H. Kittendorf	James Denver	New-Haven, Ct.
New-York, New-Haven & Hartford	E. S. Brewer	F. Leppens	Hartford, Ct.
Northern Central	G. W. Rhodes		Baltimore, Md.
Northern Central	James Strode	G. W. Demarest.	York, Pa.
Northern New-Hampshire	James W. Lander.	Albert Langmaid.	Concord, N. H.
Northern of Canada	P. Clark.	P. Clark	Toronto, Can.
Northern Pacific	**H. A. Towne		Brainerd, Minn.
Minnesota Division	W. H. Lewis	W. S. Heathcote.	Brainerd, Minn.
Dakota Division	C. W. Rossiter		Fargo, D. T.
Pacific Division	J. F. Curtis		Kalama, W. T.
North-Carolina	Rufus D. Wade	B. G. Sergeant	Co. Shops, N. C.
North-Louisiana & Texas	C. H. Tull		Monroe, La.
North-Lebanon		Henry B. Oves	Lebanon, Pa.
North-Pennsylvania	Franklin Roop	Franklin Roop	Philadelphia, Pa.
North-Eastern	D. W. Haines	A. M. Corrie	Florence, S. C.
Norwich & Worcester	Richard Colburn	G. R. Bentley	Norwich, Ct.
O			
Ohio & Mississippi		G. Hibbert	Cochran, Ind.
Ohio & Mississippi	‡J. D. W. Potts		Seymour, Ind.
Oil City & Pithole	George Thompson		Pithole, Pa.
Oil Creek & Alleghany River	H. J. Bookhammer.	John Monks	Oil City, Pa.
Old Colony & Newport	J. K. Taylor	A. Gleason	Boston, Mass.
Oregon & California	§§J. Brandt.		Portland, Oregon.
Owensburg & Russellville	J. R. Osborne		Owensburg, Ky.
P			
Paducah & Memphis	Alex. Forsyth		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Panama	Chas. E. Stewart		Aspinwall, N. G.
Pacific of Missouri	§§John Hewitt	E. Martin	St. Louis, Mo.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Pennsylvania	§§T. N. Ely		Altoona, Pa.
Pennsylvania	H. D. Garrett	I. W. Van Houten.	W. Philadelphia, Pa.
Pennsylvania	E. L. Caum	Samuel W. Myers.	Harrisburg, Pa.
Pennsylvania	G W. Strattan	John P. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver.	R. S. Ramsey	Pittsburg, Pa.
New-Jersey Division	L. A. Bosdevex		Meadow Shops, N. J.
New-Jersey Division.		David H. Baker.	Jersey City, N. J.
West-Penn. Division	C. B. Street	M. H. Fales	Blairsville, Pa.
Peoria & Rock Island	Geo. Gregg		Peoria, Ill.
Peoria, Pekin & Jacksonville	R. F. Hurd	R. F. Hurd	Pekin, Ill.
Petersburg & Weldon	R. B. Andrews	Alex. Wright	Petersburg, Va.
Philadelphia, Wilmington & Baltimore	S. A. Hodgman.	Wm. T. Worth	Wilmington, Del.
Philadelphia & Baltimore Central	S. D. Danfield.	Samuel D. Danfield.	Chester, Pa.
Philadelphia and Erie	Martin Walls		Sunbury, Pa.
	W. L. Forster		Renovo, Pa.
	W. L. Holman		Kane, Pa.
	W. T. Smith.		Erie, Pa.
	§§Howard Fry		Erie, Pa.
Philadelphia & Reading	L. B. Paxson	Aaron Steinbach.	Reading, Pa.
Germantown & Norris'n Div.	Jackson Richards		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis	E. Pierce	D. F. Andregg	Dennison, Ohio.
Pittsburg & Columbus Division		Thos. D. Furgusen.	Steubenville, Ohio.
Little Miami Division		M. P. Ford	Columbus, Ohio
Little Miami Division		J. H. Setchel	Cincinnati. Ohio.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlin	Columbus, Ohio.
Col., Cin. & Ind. Division	Geo. H. Prescott	Geo. H. Prescott	Logansport, Ind.
Pittsburg, Fort Wayne & Chicago	S. M. Cummings	John Marquis	Allegheny, Pa.
Pittsburg, Fort Wayne & Chicago	J. M. Boon	Israel Lee	Fort Wayne, Ind
Pittsburg, Fort Wayne & Chicago		J. J. Kirkland	Crestline, Ohio.
Pittsburg, Virginia & Charlston	W. Lininger		Pittsburg, Pa.
Pittsburg, Washington & Baltimore	§Wm. Stearns		Connellsville, Pa.
Pittsburg, Washington & Baltimore	J. E. Sampsel	J. M. Leach	Pittsburg, Pa.
Portland & Rochester	John G. Brady	John G. Brady	Portland, Me.
Portland & Oxford Central	Geo. W. Battles	Geo. W. Battles.	Buckfield, Me.
Portland, Saco & Portsmouth	John Donnell		Portland, Me.
Port Royal	Geo. Riley	J. H. Milton	Augusta, Ga.
Port Hope, Lindsay & Beaverton	H. G. Taylor	H. G. Taylor	Port Hope, Can.
Portsmouth, Gt. Falls & Monmouth.	James Tucker	E. Fall	Union Village, N.H.
Poughkeepsie & Eastern	John L. Driscoll	Jerry Wigg	Poughkeepsie, N. Y.
Providence & Worcester.	Joseph Kelly	Olney L. Smith	Providence, R. I.
Providence, Warren & Bristol	Rufus Smith	J. Brightman	Bristol, R. I.
Q			
Quincy, Alton & St. Louis	J. O. Gravell	W. G. Gilbert	Quincy, Ill.
Quincy, Missouri & Pacific	W. F. Smith	W. F. Smith	Kirksville, Mo.
R			
Raleigh & Gaston.	B. R. Harding	B. R. Harding	Raleigh, N. C.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Richmond, Fredericksburg & Potomac	H. Kuhn	W. H. Trainham	Richmond, Va
Richmond, Danville & Piedmont	John McFarland	J. B. Vaughan	Richmond, Va.
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond, Va.
Richmond & York River.	C. H. Harris	J. L. Thompson	Richmond, Va.
Rive De Loup	P. A. Logan	C. R. McKinnin	Fredericton, N. B.
Rome, Watertown & Ogdensburg	Abram Klohs	H. H. Sessions	Rome, N. Y.
Rome, Georgia	O. W. Harbin	O. W. Harbin	Rome, Ga.
Rochester & Genesee Valley.	M. E. Brown.	M. Wilder	Buffalo, N. Y.
Rockford, Rock Island & St. Louis	Joseph Elder.	T. F. Nolte	Beardstown, Ill.
S			
Saginaw Valley & St. Louis	W. S. Thompson		Saginaw, Mich.
San Antonio & Mexican Gulf	W. T. Bingham		Victoria, Texas.
Savannah & Charleston	P. J. Hutson	J. D. Murphy	Charleston, S. C.
Seaboard & Roanoke	§§M. M. Pendleton		Portsmouth, Va.
Selma & Gulf	Wm. T. Daughtrey.		Selma, Ala.
Selma, Rome & Dalton		W. W. Peirce	Selma, Ala.
Selma, Marion & Memphis	Dolphus Gay		Marion, Ala.
Sheboygan & Fond du Lac	John Hickey	John Hickey	Sheboygan, Wis
Sioux City & Pacific.	C. H. Foster		Missouri Val., Iowa.
Southern Pacific of California	J. P. Wilson	F. N. Bellisle	San Francisco, Cal.
South-Carolina	W. B. Smith	John Reed	Charleston, S. C.
Southern Central	Chas. G. Brown.	H. Mooney	Auburn, N. Y.
Southern, of Long Island	Mark Brear	C. Wilkinson	Brooklyn, N. Y.
Southern Minnesota			Wells, Minn.
South-Western of Georgia	C. D. Wall.		Columbus, Ga.
South-Western of Georgia	D. M. Gogel	James A. Knight.	Macon, Ga.
South Shore	Warren E. Ray		Cohasset, Mass.
South Side of Long Island	A. P. Doane	A. P. Doane	Williamsburg, L. I
Spartanburg & Union	J. N. Benner	Jacob Rice	Union C. H., S. C
Springfield, Athol & Northeastern	W. E. Granger		Springfield, Mass.
Stanstead, Shefford & Chambly	W. H. Smith		Waterloo, C. E.
Stockton & Ione		W. T. Hoyt	Stockton, Cal.
Stonington & Providence	J. H. Anderson.	J. H. Anderson	Providence, R. I.
St. Croix & Penobscot	Edward Bolton	A G. Page	Milltown, Me.
St. Joseph & Denver City	E. Sleppy		St. Joseph, Mo.
St. Lawrence & Ottawa	Calvin Dame.	Calvin Dame.	Prescott, Canada.
St. Louis, Iron Mountain & Southern.	O. A. Haynes	Oscar Doolittle	Carondelet, Mo.
Arkansas Division	L. Finlay	L. Finlay	Little Rock, Ark.
St. Louis, Vandalia, T. Haute & Ind.	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Indianapolis Division	Wm. Riley		Terre Haute, Ind.
Vandalia Division		A. J. Sanborn.	Effingham, Ind.
St. Louis, Alton & Terre Haute.	**Beriah Warren		St. Louis, Mo.
St. Louis, Salem & Little Rock	I. I. Upchurch		Steelville, Mo.
St. Louis & South-Eastern	‖L. B. Salisbury		Mt. Vernon, Ill.
Nashville Division	‖E. M. Hamstone		Edgefield, Tenn.
St. Paul & Pacific.	J. C. Monroe	T. W. Heathcote	St. Paul, Minn.
St. Paul & Sioux City	F. C. Butterfield	J. W. Lydic	Shakopee, Minn.
St. Louis, Kansas City & Northern.	W. H. Selby	C. S. Buck	Moberly, Mo.
St. Louis, Lawrence & Western	J. A. Hagan.		Lawrence, Kan.
Sullivan & Erie			Tonawanda, Pa.
Syracuse, Binghamton & New-York	H. H. Dawson	David Burling	Syracuse, N. Y.
Syracuse Northern	W. Garrison	L. W. Smith	Syracuse, N..
T			
Terre Haute & Indianapolis	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Tennessee & Pacific.	William McKeand.	William McKeand.	Nashville, Tenn.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	J. A. Hanglin		Marshall, Texas
Tioga	Peres Bonny	D. H. Stratton	Blossburg, Pa.
Toledo, Peoria & Warsaw	W. O. Hewitt	R. M. Hemphill	Peoria. Ill.
Toledo, Wabash & Western	§J. B. Morse		Fort Wayne, Ind
Toledo, Wabash & Western	‖John C. Wills.		Lafayette, Ind.
Toledo, Wabash & Western	Jacob Johann		Springfield, Ill.
Toledo, Wabash & Western		U. H. Kohler	Toledo, Ohio.
Toronto, Grey & Bruce.	Wm. Bowstead		Toronto, Can
Toronto & Nipissing	J. Haggus.		Toronto, Canada.
Troy & Boston	Foster Church	R. V. Coon	Troy, N. Y.
U			
Union Pacific	§I. H. Congdon.	‡‡Geo. E. Stevens	Omaha, Nebraska.
Eastern Division		‖A. M. Collett	Omaha, Neb.
Eastern Division		‖H. P. Makely	Grand Island, Neb.
Mountain Divison		‖Jno. E. Davis	Cheyenne, W. T.
Laramie Division		‖Floyd Heavaner	Laramie, W. T.
Western Division		‖C. A. Phipps	Evanston, U. T.
Utah Central	Thos. Pierpont	Thos. Pierpont	Salt Lake City.
Utica & Black River	John Bailey	David James	Utica, N. Y.
Utica, Chenango & Susquehanna	C. H. Brown		Utica, N. Y.
V			
Vermont & Massachusetts		Jacob Marsh	Fitchburg, Mass.
Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.
Virginia & Truckee	Wm. Bowker		Carson, Nev.
W			
Wash. City, Va. Midland & Gr. Southern	Jas. E. Waddey	J. T. Nalls	Alexandria, Va.
Washington & Ohio	Edward Dunn	Joshua Harrison	Alexandria, Va.
Welland	James Taylor	James Chase	St. Catharine, C. W.
Westchester & Philadelphia	John Moyer	N. Pawling	Philadelphia, Pa.

Railroad.	Master-Mechanic.	Master Car-Builder.	Residence.
Western & Atlantic	John H. Flynn	Wm. Grambling	Atlanta, Ga.
Western Maryland	Wm. Lannan	J. H. Nussear	Union Bridge, Md.
Western North-Carolina	J. D. Hollister	J. D. Hollister	Salisbury, N. C.
Western of Alabama	John McVey	F. M. Wade	Montgomery, Ala.
Western R. R. N. C.	M. W. Atkinson	M. W. Atkinson	Fayetteville, N. C.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
West-Feliciana	J. A. Tilton	Wm. McKelvey	Woodville, Miss.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
West-Wisconsin	Matt Ellis	J. C. Fischer	Hudson, Wis.
White Water Valley	A. W. Britton		Harrison, Ohio.
Wilmington, Columbia & Augusta	W. H. Turrintine		Wilmington, N. C.
Wilmington & Weldon	John Bissit	C. R. Clowe	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Wilmington & Reading	H. M. Missimer		Reading, Pa.
Winona & St. Peter	F. C. Ford	F. C. Ford	Winona, Minn.
Wisconsin Central	G. Campbell	J. L. Adams	Stevens' P't, Wis.
Worcester & Nashua	Albert Griggs.	Albert Griggs	Worcester, Mass.

DIRECTORY
OF
Railway Superintendents and Purchasing Agents
THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director. ‡ Ass't. Gen. Supt. § Ass't Supt.

A

Railroad.	Superintendent.	Purchasing Agent.	Residence.
Adirondack	C. H. Ballard		Saratoga, N. Y.
Alabama Central	John M. Bridges		Selma, Ala.
Albany & Susquehanna	*C. F. Young		Honesdale, Pa.
Allegheny Valley	J. J. Lawrence	John L. Awl	Pittsburg, Pa.
Arkansas Central	James A. Tappan		Helena, Ark.
Atchison, Topeka & Santa Fe	C. F. Morse	C. F. Morse	Topeka, Kansas.
Atchison & Nebraska	J. F. Barnard	J. F. Barnard	St. Joseph, Mo.
Atchison & Nebraska	*Geo. H. Nettleton		Kansas City, Mo.
Alabama & Chattanooga	C. H. Stanton	T. J. Carlile	Meridan, Miss.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Pittsburg, Pa.
Atlanta & Richmond Air Line	R. Y. Sage		Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	J. H. Holway	Meadville, Pa.
First Division	J. T. Odell		Meadville, Pa.
Second Division	A. L. Dunbar		
Third and Fourth Division	T. A. Phillips		Galion, Ohio.
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.

B

Baltimore & Ohio	Thos. R. Sharp	Benj. Williams	Baltimore, Md.
Central Ohio & Lake Erie Div.	Wm. Walker		Columbus, Ohio.
Baltimore & Potomac	Geo. C. Wilkins	A. W. Sumner	Baltimore, Md.
Bangor & Piscataquis	M. H. Angel	L. H Eaton	Bangor, Maine.
Boston, Barre & Gardner	I. N. Ross		Worcester, Mass.
Boston & Albany	*Wm. Bliss		Boston, Mass
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & Providence	A. A. Folsom	A. A Folsom	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood		Fitchburg, Mass.
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A Dodge	Lyon & Vose	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood	Boston, Mass.
Boston, Lowell & Nashua	W. M. Parker.		Boston, Mass.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Brunswick & Albany	C. L. Schlatter		Brunswick, Ga.
Burlington & Missouri River (in Neb.)	Wm. Irwin.		Plattsmouth, Neb.
Burlington, Cedar Rapids & Minnesota	W W. Walker	S. L. Dows	Cedar Rapids, Ia.
Burlington & South-Western	R. T. Hosford	O. W. Owen	Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. H. Potter	N. M. Whitside	Corry, Pa.

C

Cairo & St. Louis	J. L. Hinkley	C. Ritsema	St. Louis, Mo.
Cairo & Vincennes	Henry L. Morrill		Cairo, Ill.
Camden & Atlantic	§F. A. Lister	J. L. Wendell	Camden, N. J.
Canada Central, Brockville, & Ottawa	H. P. Alden		Brockville, Can.
Canada Southern	*L. D Rucker		Toledo, Ohio.
Canada Southern	W. Snyder	E. W. Porter	St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua, Pa.
Cayuga Lake	J. L. Grant		Ithaca, N. Y.
Central Branch Union Pacific	W. F. Downs	W. F. Downs	Atchison, Kan.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Central Pacific	‡John Corning		Sacramento, Cal.
Western Division	E. C. Fellows		Lathrop, Cal.
Visalia Division	E. C. Fellows		Lathrop, Cal.
Truckee Division	Frank Free		Wadsworth, Nev.
Humboldt Division	R. S. Matteson		Carlin, Nevada.
Oregon Divison	J. A. Fillmore		Sacramento, Cal.
Sacramento Division	J. A. Fillmore		Sacramento, Cal.
Salt Lake Division	R. H. Pratt		Ogden, Utah.
California Pacific Division	A. D. Wilder		Vallejo, Cal.
Central Vermont	J. W. Hobart		St. Albans, Vt.
Western Division	John Schrier		Ogdensburg, N. Y.
Central & Southern Division	Ambrose Arnold		St. Albans, Vt.
Northern & Eastern Division	G. L. Stone		" " "
Rutland Division	J. Burdett		Rutland, Vt.
Harlem Extension Division	J. Burdett		Rutland, Vt.
New-London Northern	G. W. Bentley		New-London, Ct.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	M. S. Dunn	J. A. Netherland	Richmond, Va.
Middle Division	H. D. Chapin		Staunton, Va.
Charlotte, Columbia & Augusta	James Anderson		Columbia, S. C.
Cheshire	R. Stewart	H. H. Stone	Keene, N. H.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt	R. W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	J. B. Mulliken		Escanaba, Mich.
Madison Division	C. A. Swineford.		Baraboo, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis.
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver		Clinton, Iowa.
Western Iowa Division	John A. Head		Boone, Iowa.
Chicago & Alton	J. C. McMullen	A. V. Hartwell	Chicago, Ill.
Chicago, Burlington & Quincy	R. Harris	D. B. Sibley	Chicago, Ill.
Chicago Burlington & Quincy	‡C. H. Hudson		Chicago, Ill.
Eastern and Middle Division			Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota	C. Harris	F. I. Massey	Dubuque, Iowa.
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	*Geo. S. Bowen	James Penny	Chicago, Ill.
Chicago & Pacific	J. M. Whitman		Chicago, Ill.
Chicago & Paducah			Streator, Ill.
Chicago, Rock Island & Pacific	Hugh Riddle.	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chicago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.
Chicago & Michigan Lake Shore	*Geo. C. Kimball	Wm. R. Morrison	St. Joseph, Mich.
Chicago, Danville & Vincennes	L. Pearson	C. B. Mansfield	Chicago, Ill.
Chicago, Milwaukee & St. Paul	*S. S. Merrill	J. J. Slocum	Milwaukee, Wis.
Chicago, Pekin & Southwestern	W. P. Sisson		Streator, Ill.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
Chicago & Canada Southern	D. Edwards		Toledo, Ohio.
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.
Cincinnati & Muskingum Valley	C. C. Wait		Zanesville, O.
Cincinnati, Richmond & Chicago	Lewis Williams		Cincinnati, Ohio
Cincinnati & Martinsville	T. C. Burnside		Franklin, Ind.
Cincinnati & Terre Haute			Terre Haute, Ind.
Cin., Cumberland Gap & Charleston	W. J. Taylor		Knoxville, Tenn.
Cincinnati Hamilton & Dayton	Lewis Williams	P. Hickey	Cincinnati, Ohio.
Cincinnati, Hamilton & Indianapolis	Lewis Williams		Cincinnati, Ohio.
Cincinnati, Lafayette & Chicago	E. H. Waldron	G. G. Hadley	Lafayette, Ind.
Cincinnati, Sandusky & Cleveland	*D. W. C. Brown		Sandusky, Ohio.
Cleveland, Columbus, Cincinnati & Ind	E. S. Flint		Cleveland, Ohio.
Indianapolis Division	C. C. Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Cleveland, Mt. Vernon & Delaware	G. A. Jones		Mt. Vernon, Ohio.
Cleveland, Tuscarawas Val. & Wheeling	*E. B. Thomas	W. W. Card, *Supt.*	Cleveland, Ohio.
Colorado Central	P. J. Nichols		Golden, Col.
Columbus & Hocking Valley	M. M Green		Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H.E.Chamberlin	H. E. Chamberlin	Concord, N. H.
Connecticut River	John Mulligan	John Mulligan.	Springfield, Mass.
Connecticut & Passumpsic Rivers	Geo. A. Merrill	Geo. Killey	Lyndonville, Vt.
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Corning, Cowanesque & Antrim	A. H. Gorton	R. J. Burnham	Corning, N. Y.
Cumberland Valley	I. F. Boyd	I. F. Boyd	Chambersbu rg, Pa.
Cumberland & Pennsylvania	J. A. Millholland		Mt. Savage, Md.

D

Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	J. R. Meckling	J. R. Meckling	Sioux City, Iowa.
Davenport & St. Paul	N. H. Wood		Davenport, Iowa.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware & Hudson Canal Co.	*C. F. Young		Honesdale, Pa.
Albany & Susq. Division	C. D. Hammond		Oneonta, N. Y.
Rensselaer & Saratoga Div	Theo. Voorhees		Troy, N. Y.
Delaware, Lackawanna & Western		G.W. B. Cushing	New-York City.
Delaware, Lackawanna & Western	W. F. Hallstead		Scranton, Pa.
Morris & Essex Division	Andrew Reasmer		Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus. Division	W. F. Hallstead		Utica, N. Y.
Denver & Rio Grande	W. W. Borst	W. S. Jackson	Denver, Col.
Detroit and Milwaukee	W. K. Muir	John S. Lorimer	Detroit, Mich.
Detroit, Hillsdale & Indiana	W. F. Parker.		Ypsilanti, Mich.
Detroit, Eel River & Illinois	A. B. Southard		Denver, Ind.
Detroit, Lansing & Lake Michigan	J. B. Mulliken	C. D. Childs	Detroit, Mich.
Dorchester & Delaware	J. M. Murphy		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer	C. V DeForest	Dunkirk, N. Y.
Dubuque & South-Western	J. P. Farley		Dubuque, Iowa.

E

East Alabama & Cincinnati	B Boyle		Opelika, Ala.
East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern	Geo. Bachelder		Boston, Mass.
Eastern & Maine Central	*C. F. Hatch	C. W. Pratt	Boston, Mass.
Erie & Pittsburg	J. M. Kimball		Erie, Pa.
Erie Railway,	E. S. Bowen	C. H. Bowman	New-York City.
Erie	P. P. Wright		Jersey City, N. J.
Eastern Division	E. O. Hill		Port Jervis, N. Y.
Delaware Division	Benj. Thomas		Port Jervis, N. Y.
Rochester Division	M. E. Brown		Rochester, N. Y.
Susquehanna Div.	C. W. Gardner		Elmira, N. Y.
Buffalo Division	R. G. Taylor		Buffalo, N. Y.
Western Division	J. S. Beggs		Buffalo, N. Y.
Erie & Pittsburg		Wm. Mullins	Pittsburg, Pa.
European & North-American	M. H. Angell	M. H. Angell	Bangor, Maine.
Evansville & Crawfordsville	John E. Martin		Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.

F

Fitchburg	Chas. L. Heywood	John Adams	Boston, Mass.
Flint & Pere Marquette	Sanford Keeler	Geo. C. Cook	East-Saginaw, Mich.
Flushing & North-Shore	I. D. Barton		Hunter's Point, L. I.
Flushing & North-Shore		A. E. Godeffroy	New-York City.
Fort Wayne, Jackson & Saginaw	P. B. Loomis		Jackson, Mich.
Fort Wayne, Muncie & Cin	W. W. Worthington		Fort Wayne, Ind.

G

Galveston, Harrisburg & San Antonio	Hardy Eddins	J. W. Pierce.	Galveston, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Georgia	Wm. McRae	John Vaughn	Augusta, Ga.
Gilman, Clinton & Springfield	D. H. Conklin		Springfield, Ill.
Grand Gulf & Port Gibson	G. W. McGinnis		Port Gibson, Miss,
Grand Rapids & Indiana	*C. E. Gorham		Fort Wayne, Ind.
S. Division	J. M. Matheany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich.
Grand Rapids & Indiana	*W. O. Hughart	William Mullins	Pittsburg, Pa.
Grand Trunk	*J. Hickson	John Taylor	Montreal, Canada.
East Division	Henry Bailey		Montreal, Canada.
West Division	W. J. Spicer		Toronto, Canada.
Grand Tower and Carbondale		Wm. W. Harris	Grand Tower, Ill.
Great Southern of Ga. & Fla	M. H. Alberger		Jacksonville, Fla.
Great Western (Canada)	Andrew Watson	Robert Beatty	Hamilton, Canada.
Green Bay & Minnesota	S. B. Kenrick		Green Bay, Wis.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.

H

Hannibal & St. Joseph	H. H. Courtright.	L. W. Towne. / W. J. Hilton. / L. W. Morse.	Hannibal, Mo.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin	D. S. Draper	Bridgeport, Ct
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	C. A. Burton		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top.	Geo. F. Gage	B. A. Knight	Huntingdon, Pa.

I

Illinois Central	Jos. F. Tucker		Chicago, Ill.
Illinois Central.	*Jas. C. Clarke	O. Ott	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois Midland	D. Hitchcock .	‡P. Campbell	Terre Haute, Ind.
Illinois & St. Louis	W. K. McComas		St. Louis, Mo.
Indianapolis, Bloomington & Western	C. C. Smith		Indianapolis, Ind.
Indianapolis, Bloomington & Western	Geo. B. Wright, Receiver		Indianapolis, Ind.
Indianapolis, Cincinnati & Lafayette	Geo. L. Barringer	E. V. Cherry	Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna		Indianapolis, Ind.
Indianapolis & Vincennes		Wm. Mullins	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward	J. W. Morse	St. Louis, Mo.
Indianapolis, Peru & Chicago	C. B. Robinson	D. Macy.	Indianapolis, Ind.
Michigan City Division	E. C. Murphy		La Porte, Ind.
Intercolonial Railway	Lewis Carvell	Sam. Watson	Moncton, N. B.
International & Great Northern	H. M. Hoxie		Houston, Texas.

J

Jacksonville, North-Western & S. E.	E. S. Greenleaf		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	Robert Walker		Jacksonville, Fla.
Jeffersonville, Madison & Indianapolis		Wm. Mullins	Pittsburg, Pa.
Jefferson, Madison & Indianapolis,	Horace Scott		Louisville, Ky.
Junction & Breakwater	Wm. Groom		Lewis, Del.

K

Kansas Central	W. R. Martin		Leavenworth, Kan.
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard	J. F. Barnard	St. Joseph, Mo.
Kansas City, St. Joseph & Council Bluffs	*Geo. H. Nettleton		Kansas City, Mo.
Kansas Midland	W. W. Fagan.		Topeka, Kan.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
Kansas Pacific	O. S. Lyford		Kansas City, Mo.
Kansas Pacific	O. S. Lyford	J. L. Woods	St. Louis, Mo.
Kaw Valley Division	O. H. Dorrance		Lawrence, Kan.
Smoky Hill Division	A. B. Garner		Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col.
Kentucky Central	G. H. Pendleton	Geo P. Bowler	Covington, Ky.
Keokuk & Des Moines Valley	Geo. H. Griggs	G. E. Kilbourne	Keokuk, Iowa.
Knox & Lincoln	C. A. Coombs	Oliver Morse	Bath, Maine.
L			
Lackawanna & Bloomsburg	D. T. Bound		Kingston, Pa.
Lackawanna & Bloomsburg		G.W. B. Cushing	New-York City.
Lake Erie & Louisville	I. H. Burgoon		Fremont, Ohio.
Lake Ontario Shore	E. A. Van Horne		Oswego, N. Y.
Lake Superior & Mississippi	G. H. Smith	C. F. Cruft	St. Paul, Minn.
Lake Shore & Michigan Southern	Charles Paine	A. C. Armstrong	Cleveland, Ohio.
Kalamazoo Division	William Wheaton		Kalamazoo, Mich.
Detroit Division			
Lansing Division			
Leavenworth, Lawrence & Galveston	B. S. Henning		Lawrence, Kan.
Leavenworth, Lawrence & Galveston	*Geo. H. Nettleton		Kansas City, Mo.
Lawrence & South-Western	R. B. Gemmell	R. B. Gemmell	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
		L. Chamberlin	Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa.
Mahony Division	James I. Blakslee		Mauch Chunk, Pa.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	T. Hartman		Little Rock, Ark.
Logansport, Crawfordsville & S. W.			Terre Haute, Ind.
Long Island	G. W. N. Custis		Hunter's Point, L. I.
Louisville & Nashville & G. Southern	Albert Fink	G. C. Breed	Louisville, Ky.
Clarksville Division	Jas. Montgomery		Bowling Green, Ky.
Memphis Division	J. T. Flynn		Memphis, Tenn.
Nashville & Decatur Division	James Geddes		Nashville, Tenn.
So. & North Ala. Division	Robert Meek		Birmingham, Ala.
Louisville, Cin. & Lexington	J. McLeod	Wm. Mahl	Louisville, Ky.
Louisville, New-Albany & Chicago	John L. Day	J. R. Parker	New-Albany, Ind.
Louisville, Paducah & Southwestern	D. F. Whitcomb	D. F. Whitcomb	Louisville, Ky.
M			
Macon & Brunswick	John A. Grant		Macon, Ga.
Macon & Western	Capt. G. I. Foreacre		Atlanta, Ga.
Maine Central	*Chas. F. Hatch		Boston, Mass.
Maine Central	Payson Tucker		Portland, Me.
Androscoggin Division	A. Brown		Lewiston, Me.
Manchester & Lawrence	H. E. Chamberlin		Concord, N. H.
Marietta & Cincinnati	W. W. Peabody	S. L. Campbell	Cincinnati, Ohio.
Marietta, Pittsburg & Cleveland	Jas. McArthur	R. B. Hoover	Marietta, Ohio.
Marquette, Houghton & Ontonagon	*Samuel Schoch	Jas. S. Mott	Marquette, Mich.
Maryland & Delaware	J. L. Caldwell	J. L. Caldwell	Easton, Md.
Memphis, Carthage & North-Western	E. H. Brown		Carthage, Mo.
Memphis & Little Rock	W. E. Smith	W. E. Smith	Memphis, Tenn.
Memphis & Charleston	W. J. Ross		Memphis, Tenn.
Michigan Central	W. B. Strong		Chicago, Ill.
Michigan Central	‡J. R. Ledyard	Allan Bourn	Detroit. Mich.
Grand River Valley Division	C. B. Bush		Grand Rapids, Mich.
Air-Line, So. Bend & Joliet	E. C. Brown		Jackson, Mich.
Bay City Division	T. B. Sargent	D. A. Waterman	Detroit, Mich.
Jackson. Lansing & Saginaw Div.	C. B. Bush		Saginaw City, Mich.
Michigan Lake Shore	Chas. E. Gorham		Fort Wayne, Ind.
Michigan Lake Shore	P. S. O'Rourke		Monteith, Mich.
Midland Railway of Canada	H. G. Taylor		Port Hope, Ont.
Midland Pacific	J. N. Converse	M. A. Showers	Nebraska City, Neb.
Milwaukee, Lake Shore & Western	H. G. H. Reed		Milwaukee, Wis.
Western Division	J. S. Buck		Appleton, Wis.
Mineral Point	G. W. Cobb	G. W. Cobb	Mineral Point, Wis.
Mineral Range	J H. Macdonald		Hancock, Mich
Mississippi & Tennessee	M. Burke	M. Burke	Memphis, Tenn.
Mississippi Valley & Western	Guy Wells		Quincy, Ill.
Missouri, Iowa & Nebraska	Col. Henry Hill		Warsaw, Ill.
Missouri, Kansas & Texas	C. H. Chappel		Sedalia, Mo.
Missouri, Kansas & Texas.		G. M. Babcock	Sedalia, Mo.
Cherokee Division	L. H. Sheldon		Parsons, Kansas.
Choctaw Division	S. G. Eddy		Dennison, Texss.
Missouri Division	J. J. Frey		Sedalia, Mo.
Sedalia Division	J. J. Frey		Sedalia, Mo.
Neosho Division	L. H. Sheldon		Parsons, Kansas.
Osage Divsion	C. M. Sheafe		Holden, Mo.
Missouri Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Missouri River, Fort Scott & Gulf	B. S. Henning	A. H. Campbell	Kansas City, Mo.
Missouri River, Fort Scott & Gulf	*Geo. H. Nettleton		Kansas City, Mo.
Mobile & Ohio	*A. L. Rives		Mobile, Ala.
Alabama Division	Cecil Fleming		Mobile, Ala.
Mississippi Division	E. S. Hosford		Macon, Miss.
Tenn. & Ky. Divis on	G. W. Robertson		Jackson, Tenn.
Mobile & Girard	W. L. Clark		Columbus, Ga.
Mobile & Montgomery	G. Jordon	G. Jordon	Montgomery, Ala.
Montgomery & Eufaula	B. Dunham	B. Dunham	Montgomery, Ala.
Morgan's Louisiana & Texas		C. A. Whitney & Co.	New-Orleans, La.
N			
Nashville, Chattanooga & St. Louis	J. W. Thomas		Nashville, Tenn.
Naugatuck	G. W. Beach		Bridgeport, Ct.
New-Brunswick & Canada		Tho. H. Street	St. Andrews, N. B.
New-Brunswick & Canada	John Stewart		St. Stephens, N. B.
New-Bedford & Taunton	Warren Ladd		New-Bedford, Mass.
New-Haven & Derby	E. S. Quintard		New-Haven, Ct.
New-Haven & Northampton	C. N. Yeamans	C. N. Yeamans	New-Haven, Ct.
New-Haven, Middletown & Willimantic	W. A. Waterbury.	W.A. Waterbury	Middletown, Ct
New-Jersey & New-York	W. D. Beasley		Jersey City, N. J.
New-Jersey Midland	W. E. Lewis		Wortendyke, N. J.
New-Jersey Southern	*W. S. Sneden		Long Branch, N. J
New-Orleans & Selma	T. H. Du Puy		Selma, Ala.
New-Orleans, St. Louis & Chicago	*E. D. Frost	S. H. Edgar, V. P.	New-Orleans, La.
New-Orleans & Mobile	D. B. Robinson	John J. Howell	Mobile, Ala.
New-York & Harlem	Chas. M. Bissell	R. C. Moore	New-York, N. Y.
New-York, New-Haven & Hartford	E. M. Reed	R. N. Dowd	New Haven, Ct.
N. Y. & N. H. Division	John T. Moody		New-York, N. Y.
Hartford Division	C. S. Davidson		Hartford, Ct.
Shore Line Division	W. H. Stephenson		New-Haven, Ct.
New-York, Boston & Montreal	C. L. Kimball		Dutchess Jn., N. Y.
New-York Central & Hudson River	J. Tillinghast		Albany, N. Y.
New-York Central & Hudson River		C. V. DeForest	New-York.
Eastern Division	Zenas C. Priest		Utica, N. Y.
Syracuse & Rochester Division	G. H. Burrows		Syracuse, N. Y.
New-York & New-England	H. A. G. Pomeroy		Boston, Mass.
Worcester Division	P. St. M. Andrews		Worcester, Mass.
New-York & Oswego Midland			New-York, N. Y.
New-Jersey Division	G. W. N. Custis		Jersey City, N. J.
Middle Division	H. M. Flint		Middletown, N. Y.
Western Division			Oswego, N. Y.
New-York, Kingston & Syracuse	F. J. Hecker		Rondout, N. Y.
New-York, Providence & Boston	A. S. Matthews	A. S. Matthews	Stonington, Ct.
New Brunswick	Tho. Hoben	W. R. Logan	Fredericton, N.B.
Northern Pacific	*C. W. Mead	E. F. Williams	St. Paul, Minn.
Minnesota Division	J. H. Sullivan		Brainerd, Minn.
Northern Pacific Division	*J. W. Sprague		Kalama, W. T.
Lake Superior & Miss. Division	George H. Smith		St. Paul, Minn.
North-Louisiana & Texas	W. R. Gordon		Monroe. La.
North-Pennsylvania	S. W. Roberts	F. A. Cornby	Philadelphia, Pa.
Northern Canada	†F. W. Cumberland		Toronto, Can.
Northern Central	*Frank Thomson		Philadelphia, Pa.
Northern (New-Hampshire)	George E. Todd		Concord, N. H.
North-Eastern (South-Carolina)	F. K. Huger		Charleston, S. C.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
O			
Ohio & Mississippi	*A. N. Chrystie		St. Louis, Mo.
Oil Creek & Alleghany River	C. J. Hepburn		Oil City, Pa.
Old Colony	J. R. Kendrick		Boston, Mass.
Omaha & North-Western	J. E. House		Omaha, Neb.
Oregon & California	J. Brandt, Jr.		Portland, Oregon.
P			
Paducah & Memphis	M. Burke		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Paris & Danville	B. F. Matthius		Danville, Ill.
Pennsylvania	G. Clinton Gardner		Altoona, Pa.
Pennsylvania	*Frank Thomson	Enoch Lewis	Philadelphia, Pa.
Philadelphia Division	W. F. Lockard		Philadelphia, Pa.
Middle Division	J. N. McCrea		Harrisburg, Pa.
Pittsburg Division	Rob't Pitcairn		Pittsburg, Pa.
Tyrone Division	S. S. Blair		Tyrone Pa.
Bedford Division	S. M. Prevost		Bedford, Pa.
West Pennsylvania Division	J. McC. Creighton		Allegheny City, Pa.
Pennsylvania & New-York Canal	A. Mitchell		Wilkesbarre, Pa.
Pensacola & Louisville	C. S. Williams		Pensacola, Fla.
Peoria & Rock Island	John R. Hilliard		Peoria, Ill.
Peoria & Rock Island	*W. R. Hamilton	W. R. Hamilton	Peoria, Ill.
Peoria, Pekin & Jacksonville	James F. Kelsey	John Allen	Pekin, Ill.
Petersburg	R. A. Bacon	W. P. Taylor	Petersburg, Va.
Philadelphia & Reading	J. E. Wootten		Philadelphia, Pa.
Catawissa & Williamsport Br'ch	George Webb		Pittsburg, Pa.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Lebanon & Tremont	H. W. Tracy		Pine Grove, Pa.
Philadelphia and Baltimore Central	Henry Wood	Henry Wood	Philadelphia, Pa.
Philadelphia & Erie	W. A. Baldwin		Williamsport, Pa.
Philadelphia & Erie		Enoch Lewis	Philadelphia, Pa.
Western Division	J. W. Reynolds		Erie, Pa.
Middle Division	Edmund L. Tyler		Renovo, Pa.
Eastern Division	Thomas Gucker		Williamsport, Pa.
Philadelphia, Wilmington & Baltimore	H. F. Kenney		Philadelphia, Pa.
Pithole Valley	J. T. Odell		Pithole City, Pa.
Pittsburg, Cincinnati & St. Louis	S. M. Felton, Jr.	Wm. Mullins	Pittsburg, Pa.
Pittsburg & Cin. Division	S. M. Felton, Jr		Pittsburg, Pa.
Little Miami Division	J. D. Ellison		Cincinnati, Ohio.
Indianapolis & C. Division	D. W. Caldwell		Columbus, Ohio
Pittsburg, Washington & Baltimore	E. K. Hindman		Connellsville, Pa.
Pittsburg, Ft. Wayne & Chicago	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Eastern Division	George Webb		Pittsburg, Pa.
Western Division	C. D. Gorham		Fort Wayne, Ind.
Port Royal	R. G. Fleming		Augusta, Ga.
Portland & Ogdensburg	J. Hamilton	John E. Donnell	Portland, Maine.
Portland & Rochester	W. H. Turner	W. H. Turner	Portland, Maine.
Portland, Saco & Portsmouth	Francis Chase		Portland, Maine.
Portsmouth, Great Falls & Conway	J. W. Sanborn		Portsmouth, N. H.
Portsmouth	H. E. Chamberlin		Concord, N. H.
Poughkeepsie & Eastern	J. A. Perkins	A. W. Cable	Poughkeepsie, N Y
Providence & Worcester	W. D. Hilton	W. D. Hilton	Providence, R. I.
Providence, Warren & B	Waterman Stone		Providence, R. I.
Q			
Quincy, Alton & St. Louis	N. J. T. Dana	N. J. T. Dana	Quincy, Ill.
Quincy, Missouri & Pacific	J. R. Buchanan		Quincy, Ill.
R			
Raleigh & Gaston	A. B. Andrews	A. B. Andrews	Raleigh, N. C.
Richmond, York River & Chesapeake	E. F. Folger	Hugh Graham	Richmond, Va.
Richmond & Danville	T. M. R. Talcott		Richmond, Va.
Richmond, Fred. & Potomac	E. T. D. Myers	T. L. Courtney	Richmond, Va.
Richmond & Petersburg	Augustus Shaw		Richmond, Va.
Rockford, Rock Island & St. Louis	W. H. Ferry, Receiver		RockIsland, Ill.
Northern Division	Henry Looseley		Rock Island, Ill.
Southern Division	Geo. L. Walker		Beardstown, Ill.
Rome, Watertown & Ogdensburg	J. W. Moak		Watertown, N. Y.
S			
St. Lawrence & Ottawa	R. Luttreil		Prescott, Can.
St. Joseph & Denver City	*L. D. Tuthill		St. Joseph, Mo.
St. Paul & Pacific	E. Q. Sewell	E. C. Becker	St. Paul, Minn.
St. Paul & Sioux City	J. F. Lincoln	J. F. Lincoln	St. Paul, Minn.
St. Louis, Alton & Terre Haute	W. G. Broughton		St Louis, Mo.
St. Louis, Iron Mountain & Southern	Arthur W. Soper	W. S. Cuddy	St. Louis, Mo.
St. Louis, Iron Mountain & Southern	*Tho. McKissock		St. Louis, Mo.
St. Louis & South-Eastern	*E. F. Winslow	A. G. Thompson	St. Louis, Mo.
St. Louis Division	George S. Winslow		Mt. Vernon, Ill.
Nashville Division	R. H. G. Minty		Nashville, Tenn.
St. Louis, Kansas City & Northern	W. R. Arthur	R. W. Green	St. Louis, Mo.
St Louis Division	W. H. Vaughan		St. Louis, Mo.
Western Division	C. L. Dunham		Kansas City, Mo.
St. Louis, Vandalia, Terre Haute & Ind.	John E. Simpson		Indianapolis, Ind.
St. Louis, Vandalia, Terre Haute & Ind.	Chas. R. Peddle		Terre Haute, Ind.
St. Louis, Lawrence & Western	E. C. Devereaux		Lawrence, Kan.
St. Louis, Salem & Little Rock	J. W. Blanchard	H. A. Crawford	St. Louis, Mo.
Sacramento Valley & P. & S. V	F. A. Bishop		Sacramento, Cal.
Saginaw Valley & St. Louis	N. M. Merrill.	N. M. Merrill.	Saginaw, Mich.
San Francisco & Northern Pacific	A. A. Bean	F. H. Gudes	Petaluma Cal.
San Rafael & San Quentin.	David Nye		San Rafael, Cal.
Savannah & Charleston	C. S. Gadsden		Charleston, S. C.
Seaboard & Roanoke		E. G. Ghio	Baltimore, Md.
Selma, Marion & Memphis	E. W. Rucker	E. W. Rucker	Marion, Ala.
Selma, Rome & Dalton	M. Stanton		Selma, Ala.
Sheboygan & Fond du Lac	L. A. Emerson	L. A. Emerson	Fond du Lac. Wis.
Shenango & Allegheny	I. T. Blair		Greenville, Pa.
Sioux City & Pacific	L. Burnett	L. Burnett	Missouri Valley, Ia.
Sodus Point & Southern	H. Van Vleck		Sodus Point, N. Y.
South-Shore	J. R. Kendrick		Boston, Mass.
South Carolina	S. S. Solomon	A. Mitchell	Charleston, S. C.
Southern Central	Jas. G. Knapp		Auburn, N. Y.
Southern, of Long Island	I. D. Barton		Hunter's Point, L.I.
Southern, of Long Island		A. E. Godeffroy	New-York City.
Southern Minnesota	W. C. Van Horne		Wells, Minn.
Southern Pacific of California	A. N. Towne		Sacramento, Cal.
North Division	A. C. Bassett		San Francisco, Cal.
Los Angeles Division	E. E. Hewitt		San Francisco, Cal.
Southwestern of Georgia	Virgil Powers		Macon, Ga.
Spartanburg & Union	W. W. Davies		Spartanburg, S. C.
Springfield Athol & Northeastern	John W. Phelps		Springfield, Mass.
Springfield & North-Western	*A. J. Ware		Pekin, Ill.
Staten Island	J. W. Wilbur		New-York, N. Y.
Stockton & Ione	W. G. Miller		Stockton, Cal.
Stonington & Providence	A. S. Mathews	A. S. Mathews	Stonington, Ct.
Sullivan & Erie	Wm. Stevenson		Towanda, Pa.
Summit County	W. M. Riter		Coalville, Utah.
Syracuse Northern	C. B. Morse		Syracuse, N. Y.
Syracuse, Binghamton & New-York	T. Voorhees	G. W. B. Cushing	Syracuse, N. Y.
T			
Tennessee & Pacific	George Maney		Nashville, Tenn.
Terre Haute & Indianapolis	J. E. Simpson		Indianapolis, Ind.
Terre Haute & Indianapolis		C. R. Peddle	Terre Haute, Ind.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	Geo. H. Noble		Marshall, Texas
Tioga	L. H. Shattuck		Blossburg, Pa.
Toledo, Peoria and Warsaw	A. L. Hopkins, *Receiver*		Peoria, Ill.
Western Division	David K. Smith		Peoria, Ill.
Western Division	William E. Dorwin		Warsaw, Ill.
Toledo, Wabash & Western	Robert Andrews	J. T. Sterling	Toledo, Ohio.
Eastern Division	K. H. Wade		Lafayette, Ind.
Western Division	C. W. Bradley		Springfield, Ill.
Toledo, Canada Southern & Detroit	D. Edwards		Toledo, Ohio.
Troy & Boston	C. W. Moseley		Troy, N. Y.
Toronto, Grey & Bruce	N. Weatherston	W. Watson.	Toronto, Can.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Toronto & Nipissing	J. C. Bailey		Toronto.
Tuckerton	J. Naramore		Tuckerton, N. J.
U			
Union Pacific	S. H. H. Clarke	S. H. H. Clarke	Omaha, Neb.
Mountain Division	S. J. Nichols		Cheyenne, Wyom'g.
Laramie Division	S. T. Shankland		Laramie, Wyoming.
Western Division	O. H. Earll		Evanston, Wyoming.
Utah Central & Southern	John Sharp	S. H. Hill	Salt Lake City
Utica & Black River	J. F. Maynard		Utica, N Y.
Utica, Ithaca, & Elmira	H. P. Goodrich		Ithaca, N. Y.
V			
Vermont & Mass. & Troy & G	O. T. Ruggles	O. T. Ruggles	Fitchburg, Mass.
Vicksburg & Meridian	E. F. Raworth		Vicksburg, Miss.
Virginia & Truckee	H. M. Yerington	C. P. Mason	Carson, Nevada.
W			
Washington & Ohio	R. H. Havener	Lewis McKenzie	Alexandria, Va.
Welland	William Pay		St. Catherine, Ont.
Westchester & Philadelphia	Henry K. Smith	J. J. Bryant	Philadelphia, Pa.
West-Wisconsin	W. G. Swan		Hudson, Wis.
West-Jersey	W. J. Sewell	Enoch Lewis	Camden, N. J
Western of Alabama	Chas. P. Ball		Montgomery, Ala.
Western of North-Carolina	John M. Rose		Fayetteville, N. C.
Western & Atlantic			Atlanta. Ga.
Western Maryland	*J. M. Hood		Baltimore, Md.
Western Union	D. A. Olin		Racine. Wis.
Wilmington & Western	David Connell		Wilmington, Del.
Wilmington, Columbia & Augusta	James Anderson	James Anderson	Wilmington, N. C.
Wilmington & Weldon	J. F. Devine		Atlanta, Ga.
Wilmington & Reading	E. Collings	C. Stoltz	Coatesville, Pa.
Winona & St. Peter	S. Sanborn		Madison, Wis.
Winona & St. Peter		R. W. Hamer	Chicago, Ill.
Wisconsin Central	E. B. Phillips		Milwaukee, Wis.
Worcester & Nashua	C. S. Turner	C. S. Turner.	Worcester, Mass.



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Fits any Pen. Rubber, $2, $2.50, $3.50, and $4.

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The attention of those who are running heavy journals is respectfully invited to the above Liquid Cooler. It has been successfully used for upward of two years, and is constantly growing in favor, as its merits become known, and we are confident that practical men can not fail of being convinced that our preparation deserves their candid attention. What we claim for it is :

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and extinguish the flame when the box is on fire; that its use will, in a great measure, prevent the occurrence of a hot journal, and save the expense, delays, and annoyances incident thereto; that it will eliminate the heat from a journal at a temperature greatly below the point required to melt the babbitt, preventing an accumulation of heat, and by a timely application save it from destruction; that its non-inflammable elements (where waste is used) permeate the waste and prevent its taking fire; that it keeps the journal smooth and polished, preventing unnecessary friction; that its combination is based upon true scientific principles, which renders it impossible to fail in its results, and is

The only Preparation that will Cool a Hot Journal

while it is in motion, as attested by certificates below; that one thorough application on a hot journal will do more execution in cooling than the constant application of water for half an hour, besides doing it evenly and without loss of time.

Every Railroad or Steamboat

should have a can of the Liquid Packing on board, with the directions for its use pasted upon it, and thus always have at hand the means of effectually cooling a hot journal, and thereby avoid the expense, danger, and trouble from this cause.

AN EXCELLENT AND DURABLE LUBRICATOR

can also be made by combining with the Liquid Cooler and Packing certain quantities of oil, according to the season of the year in which it is to be used, as set forth in the directions. The combination produces a soft, heavy body, that is very essential in hot weather. The Liquid also keeps oil sweet, by preventing oxidation, and its value is greatly enhanced by the additional body which it acquires; and, considering the increased durability, it will be found a matter of considerable economy to combine the Liquid and oil together.

This preparation will be found especially valuable for Steamships, and it has been a leading idea in its combination to especially adapt it for their use. There is, however, no class of machinery, where heavy bearings are used, where it can not be employed beneficially and economically.

On Railroads where Black oil is used as a lubricator exclusively, mixed as directed, especially in warm weather, it will be found a great improvement, and fully equal to lard oil, making a considerable percentage of saving in cost, lessening the liability of hot boxes; and animal oil can be entirely discarded, even in warm weather, and as good results obtained, with less expense, as where all animal oil is used.

The Liquid Cooler and Packing is put up in two forms, one for journals not using waste-packing, such as Steamships, etc., the other for journals on Railroad cars, etc. *In ordering, be particular to state which class of work it is required for.*

We manufacture suitable cans for using the Liquid Packing. Send for circulars containing full description and instruction for use.

WHAT RAILROAD MEN SAY OF IT.

Boston, Lowell and Nashua R.R. Superintendent's Office,
Boston, April 13, 1874.

P. Noyes, Agent:

Dear Sir: We have been using your Liquid Cooler and Packing, and consider it one of the best articles for cooling off hot boxes that we have ever been acquainted with. All of our trains are supplied with a can of it.

John B. Winslow, *Supt.*

Person Noyes, Esq., East Cambridge, Mass., March 4, 1874.

Agent Belt and Leather Stuffing Co.:

Dear Sir: In reply to your inquiry in regard to Liquid Cooler and Packing, allow me to say:

I have just sent in a requisition for three barrels, which I trust you have received before this. I will only say in recommending it, that it is the best article I have ever used, and our conductors and engineers all indorse my sentiments.

I have ordered eighteen more cans, which I think will meet your approbation. I intend to have one on every train, and on long trains two, and have them made with inch nozzles, and a cap attached by chain, to prevent thickening; also a packing-iron about fourteen inches long, attached to a slot in the can, to be used in stirring up the Liquid, and also for drawing the waste out on the front side, and crowding it in on the back side, before putting the packing in. This little packing-iron I find very essential, as it is always at hand, and will prevent delay in searching for a suitable article in times of emergency. Yours truly,

JOHN F. CROCKETT, *M. M., Boston, Lowell, and Nashua R. R.*

Person Noyes, Esq., Chicago, Dec. 10, 1873.

Agent Belt and Leather Stuffing Co.:

Dear Sir: The barrel Liquid Packing sent on trial is approved, and you will please send us five barrels more. Yours, H. I. HIGGINS, *Purchasing Agent C., B., and Q. R. R.*

Chicago, March 23, 1874.

P. Noyes, Agent: Please forward to C., B., & Q. R. R., and send bill of same to this office, eight barrels of Liquid Packing and Cooler, same as purchased of you before, and send as soon as possible. H. I. HIGGINS, *Purchasing Agent.*

Agent Belt and Leather Stuffing Co.: Chicago, Ill., May 7, 1874.

Dear Sir: You will please forward to the C., B., and Q. R. R. ten barrels Liquid Packing.

H. I. HIGGINS, *Purchasing Agent C., B., and Q. R. R.*

Mr. Noyes: Fitchburg, Mass., Aug. 20, 1872.

Dear Sir: I have used your Liquid Packing for the past four months, and am perfectly well satisfied that it is the most effectual article ever in use for the purpose claimed. I have just ordered another barrel. If all railroad companies would adopt your Liquid Cooler, I think they would find a saving of nearly 20 per cent, when used with mineral or black oil, according to your directions. JACOB MARSH, *Master Car Builder, Troy and Greenfield R. R.*

Mr. P. Noyes: Salem, Mass., Aug. 7, 1872.

Dear Sir: I have been using your Liquid Packing for cooling car journals, for some time past, and have been well pleased with it. I have had occasion to use it a number of times under Pullman Cars, and it has been a complete remedy in every case of hot journals.

Every train should be provided with it, as it is a saving of time and expense in the running of trains, provided it is applied and cared for according to directions for using.

J. P. SOMERBY, *M. C. B. of Eastern Railroad.*

P. Noyes, Esq: Albany, Nov. 1, 1872.

Dear Sir: I received the barrel of Liquid Cooler and Packing you sent me for trial, and gave it out to our most experienced conductors, to use according to directions. Below please find their report:

"We, the undersigned, Freight Conductors on the Eastern Division of the N. Y. C. & H. R. R. R., have used the Liquid Cooler furnished by Mr. Jones, and find that when we arrive at a station with a hot journal, the Liquid Packing cools it sufficiently by the time we arrive at the next station to use the black oil, and then have no trouble in getting through with it. It is the best we ever used.—R. H. Fisher, A. W. Getmans, R. H. Heath, Wm. Hess, Conductors E. Div., N. Y. C. R. R. I. Ferguson, Conductor H. R. R. R."

JOSEPH JONES, *M. M., N. Y. C. & H. R. R. R., E. Div.*

CERTIFICATES OF NAVAL OFFICERS.

[COPY.]
Bureau of Steam Engineering,
Navy Department,
Washington, April 12.

Chief Engineer's Office,
U. S. Navy Yard, Washington, March 30, 1875.

Commodore Thos. H. Patterson,
U. S. N., Commandant:

Sir: In obedience to your order of December 24, 1874, to test the Liquid Cooler of Person Noyes, of Boston, Mass., and report upon the results, I respectfully submit the following :

This Liquid is a composition possessing both lubricating and cooling qualities, and when mixed with other oils, gives it more body and prevents oxidation.

The test was made upon a journal 9½ inches in diameter and 14 inches long, making seventy revolutions per minute. The journal was rough and in bad condition at the commencement of the test, and was allowed to become hot; the Liquid was applied and in a few minutes it was reduced to a good working condition. Several experiments were made, all with equally favorable results. The Liquid can be mixed with other oils, or, in extreme cases, with fresh or salt water, the latter being preferable, as it amalgamates more readily with the Liquid, which at the same time retains its lubricating qualities. It is very efficient for cooling hot journals, and the cost is about one half that of sperm oil.

The Castor Oil Belt Dressing is an excellent article for preserving belts. It protects the surface from the atmosphere, keeps them pliable, and makes them adhere closely to the pulley, and more durable. Very respectfully, your ob't serv't,

(Signed) EDWARD FITHIAN, *Chief Engineer, U. S. N.*

Person Noyes, Agent: Boston, April 15, 1875.

Dear Sir: I have been using your Liquid Cooler for some six months past, and can say of it that in all respects it is far superior to any thing of the kind I have ever used. After having tried many cooling mixtures, down even to cold water, upon one of our engine bearings, without success, your Cooler has worked a complete change, to our entire satisfaction. I also find that with one third of your Liquid and two thirds oil, it has the desired effect of keeping cool bearings and lubricating them perfectly at the same time. In some extreme cases it may be expedient to use more than one third of the Liquid. With what experience I have had, I find it the best article for all bearings, and use the same on all machinery in my department. Would cheerfully recommend it to all parties who have charge of machinery for economy and durability, and, both afloat and ashore, engineers will find it of great benefit to them.

I have also tried your Castor Oil Belt Dressing on my belts, and consider it the best article for softening and preserving the leather that I have ever used.

Yours, most truly,

THOS. J. MARSTON, *Navy Yard, Boston.*

P. Noyes,
Agent Belt and Leather Stuffing Co.: Boston, April 15, 1875.

Sir: I have had in use for some time past, your Liquid Cooler, and having given it a thorough trial, I can say that I regard it as being the best article for cooling a hot journal that I have ever used. I have tried it on thrust bearings, which is the worst place for heat that I have on board ship, and it cooled it down splendidly. I find by mixing one part of your Cooler with about two parts lard oil that my anxiety was lessened considerably, after having it in use forty-eight hours, regarding hot bearings. By attention to mixing and stirring, it will cool down the bearing. I save about one third by mixing Liquid Cooler with lard oil. I would recommend any one to try it, both for its economy and cooling properties.

Yours, very truly,

A. MORRISON, *Chief Engineer Steamship Carroll.*

Send for a Barrel. No charge unless it does all we state.

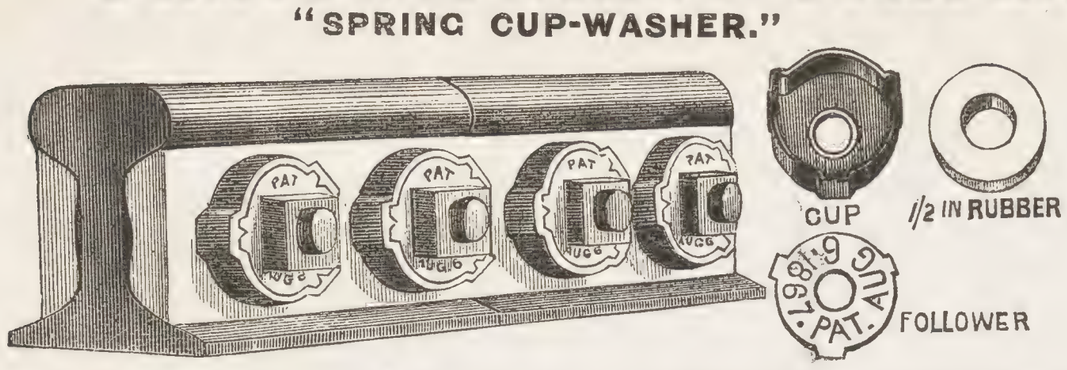
Manufactured by the Belt and Leather Stuffing Co.,

47 INDIA STREET, BOSTON.

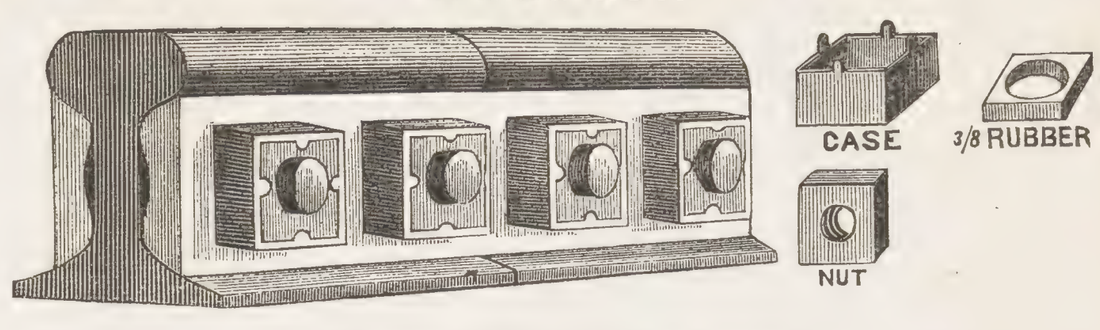
Sold by Vose, Dinsmore & Co., New-York.

PRATT'S PATENT COMPENSATING FISH-PLATE JOINTS.

"SPRING CUP-WASHER."



"SPRING NUT."



Track Bolts and Nuts are constantly subjected to a vibration and jar. One large item of expense is for wrench-work and replacement of bolts and nuts already off.

Most of the contrivances for removing this trouble are failures. They do not remove the cause of the trouble. This can only be done by some elastic material, which will absorb the vibration and prevent its reaching the nuts. Experience proves that permanent elasticity can not be obtained by using wood, which is perishable, or steel, which can not be made of uniform temper. In our inventions, the elastic packing of rubber between the nut and the plate absorbs the jar or vibration, insulates the nut, and by removing the cause of the trouble removes the trouble itself. Among its advantages are these:

1st. It saves the expense of wrench-work and loss of nuts.
2d. The rubber absorbs the blow given by the wheels at the joint, in such manner as to prevent fracture of rails at the joint, and accidents resulting therefrom.
3d. The track is made noiseless.
4th. Rails are saved from pounding out at the ends, and the thread of the bolts and nuts from stripping.

The practical value of these inventions is more fully demonstrated by the two million joints now long in use.

Manufactured and Sold by

THE PRATT MANUFACTURING COMPANY,

NO. 71 BROADWAY, NEW-YORK,

Manufacturers and Dealers in all kinds of RAILWAY TRACK SUPPLIES; also, New-York Agents for the Tuttle & Whittemore Co., Naugatuck Conn., Manufacturers of REFINED MALLEABLE IRON CASTINGS, from Patterns to order.

Special attention given to MALLEABLE IRON CASTINGS for Railroad Car construction.

VOSE, DINSMORE & CO.,

Manufacturers of

RAILWAY CAR SPRINGS

OF EVERY DESCRIPTION,

INCLUDING THE "COMBINATION ELLIPTIC SPRING."

Special attention is called to our Patent **CLIFF ELLIPTIC SPRINGS** for Freight and Passenger service. See advertisement, page ii.

Steel Rails, Locomotive and Car Tires, Elliptic Springs and Cast Steel of all descriptions.

JOHN C. WYMAN, General Manager.

194 Lake Street, Chicago.
720 North Second Street, St. Louis.

32 Warren St.,
NEW-YORK.

Railroad and House Painters' Colors,

Made from the Very Best Materials and especially prepared for Painting Railroad Cars, Station-Houses or Depots, Bridges, etc., etc.

BUYERS WILL FIND IT GREATLY TO THEIR ADVANTAGE TO EXAMINE OUR PAINTS WHEN PURCHASING.

Sample Cards furnished upon application.

Manufactured by BAXTER, BELL & CO., 21 Park Place and 18 Murray St.,

NEW-YORK,

Manufacturers and Importers of White Lead, Zinc Paints, Oils, Varnishes, Glass, Putty, Whiting, etc., Fine and Ordinary Colors, Dry and in Oil.

HOADLEY & PERKINS

Manufacturing Co.

COR. FRANKLIN AND CENTRE STS.

(New-Haven Railroad Freight Depot),

MANUFACTURERS OF

BRASS COCKS

For Steam, Water, and Gas.

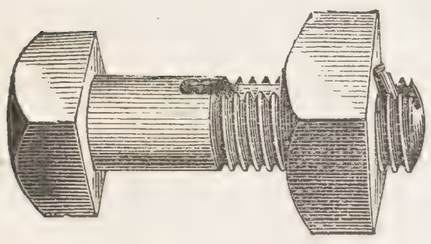
☞ *Illustrated Catalogue and Price-List furnished on application.*

Wm. Courtenay, President. Chas. F. Cobb, Secretary.

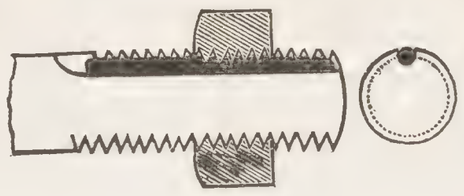
The Lock-Nut and Bolt Co., of New-York,

Office, No. 17 DEY STREET, New-York.

Manufacturers of all kinds of BOLTS, for FISH-PLATES, CARS, BRIDGES, MACHINERY, CARRIAGES, &c., with the



"Cumming Nut-lock,"
Patented
June 16, 1868,
August 23, 1870.



SECTIONS.

Unequaled for CHEAPNESS, SIMPLICITY & EFFECTIVENESS.

This simple device, as will be seen by the engravings, consists of a groove being cut in the threaded part of a screw bolt into which is placed a key of copper wire, or other soft metal; when the nut is screwed on, it cuts a thread on the key, thereby making it impossible for the key to get out until the nut is taken off. When the nut is screwed up to its place, that part of the key over which the nut has passed is riveted up against the nut with a small punch, destroying the thread on the key. The nut, therefore, can not move backward until force is used, as with a wrench.

The groove can be rapidly cut with a simple machine designed for the purpose.

Experience has proved this device absolutely reliable, and it is the cheapest of all known devices for the purpose. By its use, old bolts on which the nuts have become too slack for use can be made as good as new, making it a great saving to railroad companies and others in that item alone. It is cheaper than a check-nut.

If the bolt should become slack from shrinking of timber or other causes, *the nut will always remain firmly attached to the bolt*, and, with the wrench, can be screwed up *any distance*, and the wire riveted up any number of times, or can be taken off without injury to the nut or bolt.

This is the only method in use that locks the nut firmly to the bolt without regard to place or surroundings, all others require some attachment that holds the bolt in its position, and a washer or other attachment to keep the nut from turning.

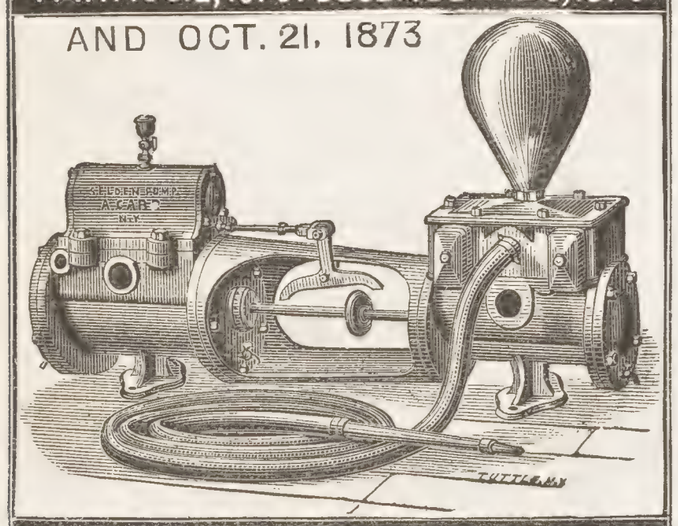
Directions for Use.—Place the copper key in the slot, pointed end out, and beveled side up, in such a position that when the nut is screwed to its place about three-eighths of an inch of the key will project beyond its outer face. Then screw the nut to its place *over the key*, allowing it to cut its own thread in the copper. Then take a narrow flat set punch, and rivet the projecting part of the key *solidly* against the outer face of the nut. To tighten the nut: screw it up, and rivet the key tighter. To remove the nut: simply apply the wrench and unscrew the nut. It will cut its own way out through the copper. The same key can be used several times, by moving it outward a few threads in the slot.

"DEAD STROKE" POWER HAMMER.

IMPROVED ADJUSTABLE CRANK PIN.
Strikes Blow Heavy or Light, Fast or Slow.
Prices Reduced Jan. 1st, 1875.
The Hull & Belden Company, Danbury, Ct.

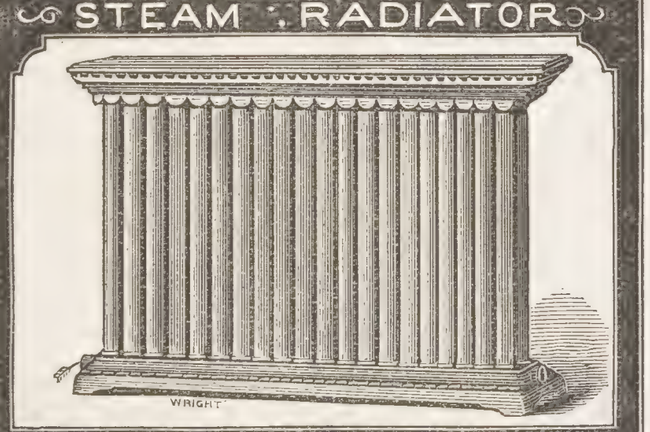
THE SELDEN DIRECT-ACTING STEAM-PUMP

PAT. AUG. 2, 1870. DECEMBER 20, 1870
AND OCT. 21, 1873



COMBINING SIMPLICITY AND DURABILITY TO A REMARKABLE DEGREE. ITS PARTS ARE EASY OF ACCESS AND IT IS ADAPTED TO ALL PURPOSES FOR WHICH STEAM PUMPS ARE USED

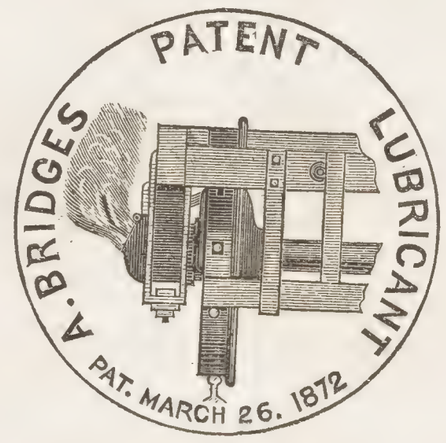
A. CARR
MANUFACTURER AND PROPRIETOR,
43 CORTLANDT ST. NEW YORK.
CARR'S POSITIVE CIRCULATING
STEAM RADIATOR



THE ONLY UPRIGHT STEAM RADIATOR MADE WHICH HAS A POSITIVE CIRCULATION.
ALSO
WROUGHT IRON PIPE, BRASS FOR AND CAST WORK &c.,
PLUMBERS, STEAM AND GAS FITTERS.
SEND FOR DESCRIPTIVE CIRCULAR AND PRICE LISTS.

HOT JOURNALS ENTIRELY PREVENTED

BY THE USE OF



For Railroad Car Journals and other Bearings.

In presenting this Lubricant to the notice of Railroad and Steamboat Managers and Operators in Machinery generally, I do so with a practical knowledge of its merits, and with confidence that it will be found to possess invaluable qualities as a

Lubricator and Counteractor of Friction.

It has been in use, during the past two years, on a number of Railroads and Steamers, and is highly approved of.

Parties wishing to make a practical test of the Lubricant will be furnished with sample on application.

ALBERT BRIDGES, Patentee,

MANUFACTURER AND DEALER IN

RAILWAY SUPPLIES and MACHINERY,

No. 46 CORTLANDT STREET,

SEND FOR CIRCULAR. NEW-YORK.

HARRISBURG FOUNDRY AND Machine Company,

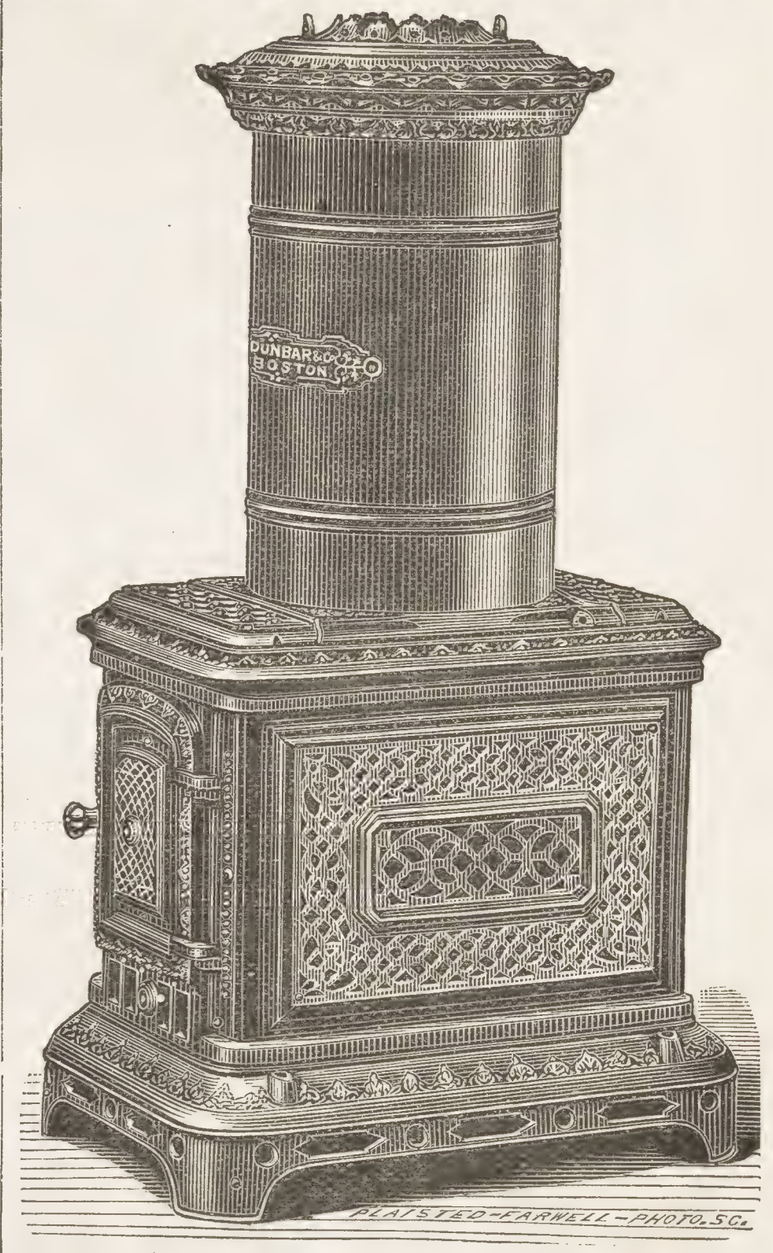
HARRISBURG, PA.

Manufacture all kinds of Machinists' and Car-Builders' Tools, for working Iron, such as Lathes, Planers, Slotting Machines, Horizontal Drilling and Boring Machines, Vertical Drills, all sizes, Shaping Machines, Bolt Cutters, Nut Tappers, Car Wheel Borers, Hydraulic Wheel Press, Axle Lathes, etc. Patent Sectional Tubular Boiler, safety and great economy at moderate cost.

Also Oil Tank Cars, Boiler and Sheet Iron work of all kinds, Foundry Cupolas, Cranes, Ladles, etc.

SAMUEL FISK, General Manager.

GEO. DUNBAR & CO.'S Railway-Car Stove.



The above cut represents our new Railway Wood-Burning Car Stove, which for Style and Economy is unsurpassed by any in the market.

GEO. DUNBAR & CO.

Dealers in

General Railroad Supplies,

19 FEDERAL ST., BOSTON.

General Selling Agents for Boston Car-Spring Co. and Chrome Steel Co.

THE UNION WHITE LEAD MANUFACTURING COMPANY. PURE

Union White Lead Manufacturing Co.,

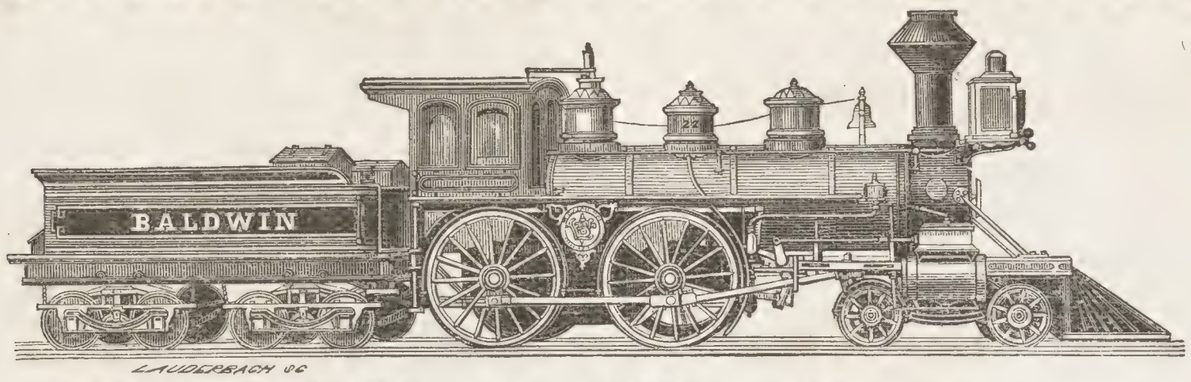
26 Burling Slip, New-York.

B. W. HOW, Secretary. JAMES HOW, President.

MANUFACTURERS OF

WHITE LEAD, RED LEAD, LITHARGE, ORANGE MINERAL.

BALDWIN LOCOMOTIVE WORKS.



BURNHAM, PARRY, WILLIAMS & CO., Philadelphia,

MANUFACTURERS OF

LOCOMOTIVE ENGINES,

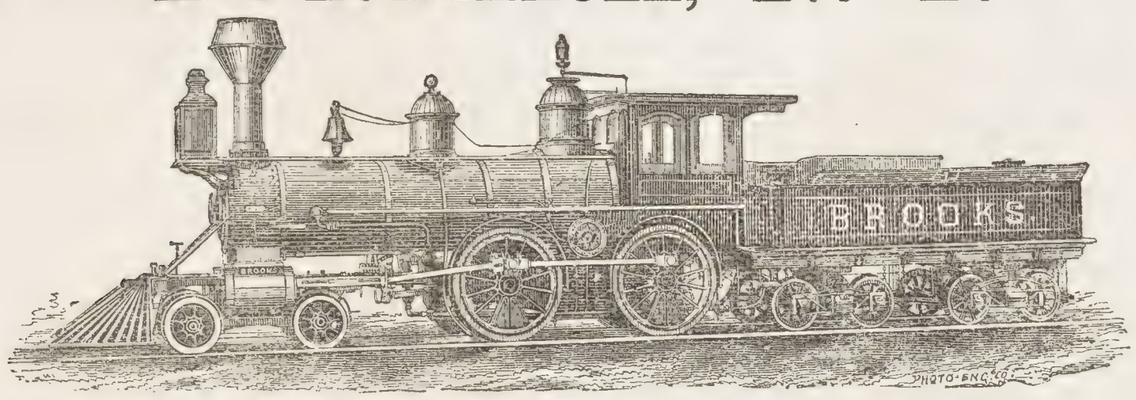
Especially adapted to every variety of Railroad use, including Mine Engines and Locomotives for Narrow-Gauge Railways.

All Work thoroughly interchangeable.

GEO. BURNHAM, CHAS. T. PARRY, EDWARD H. WILLIAMS, WM. P. HENSZEY, EDWARD LONGSTRETH, JOHN H. CONVERSE.

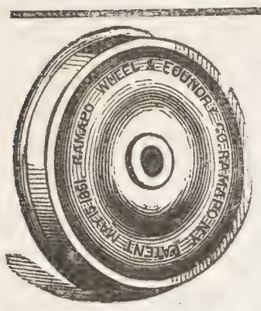
BROOKS LOCOMOTIVE WORKS,

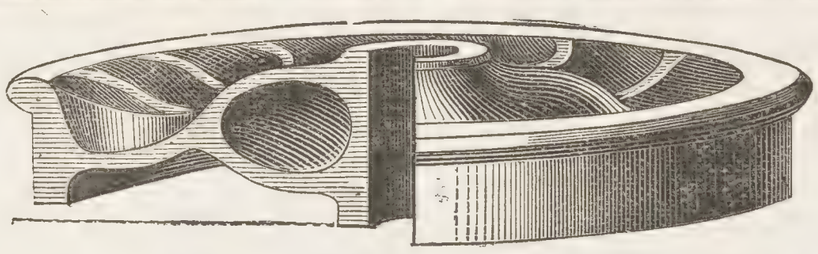
DUNKIRK, N. Y.

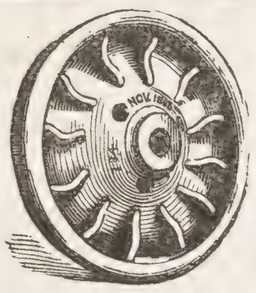


Orders solicited for Locomotives adapted to every class of Railway service.

M. L. HINMAN, Sec. and Treas. H. G. BROOKS, Pres. and Supt.







RAMAPO WHEEL AND FOUNDRY CO.,

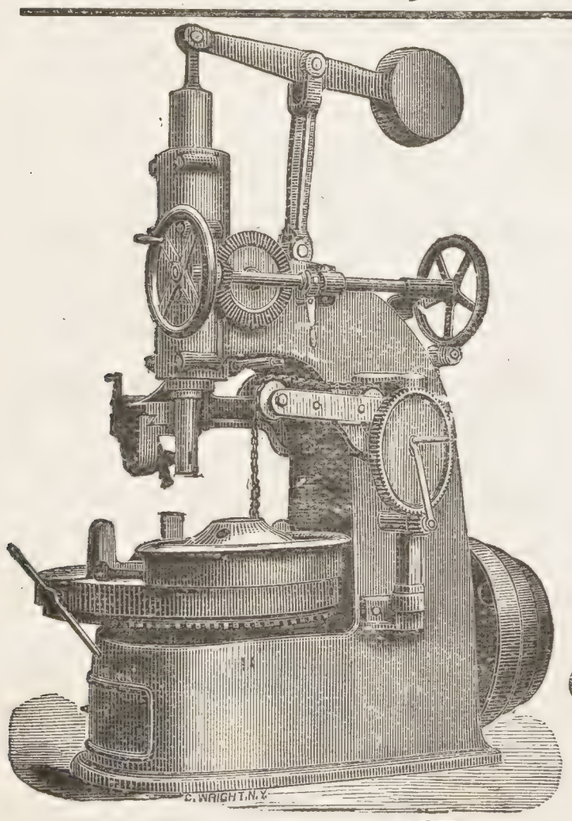
MANUFACTURERS OF

Chilled Wheels for Drawing-Room and Sleeping Coaches,

LOCOMOTIVES, TENDERS, PASSENGER AND FREIGHT CARS.

GEO. CHURCH, Pres't and Treasurer. W. W. SNOW, Sup't and Gen'l Manager.

RAMAPO, ROCKLAND COUNTY, N. Y.



NEW-YORK STEAM ENGINE CO.
MANUFACTURERS OF
MACHINISTS' TOOLS
OF ALL DESCRIPTIONS
CHAS. A. CHEEVER, TREAS. No. 98 CHAMBERS ST
GEO. Q. DOW, SEC'Y. NEW-YORK

WE HAVE THE BEST AND MOST COMPLETE ASSORTMENT OF

MACHINISTS' TOOLS

IN THE COUNTRY, COMPRISING ALL THOSE USED IN

MACHINE, LOCOMOTIVE, AND CAR SHOPS.

WE MAKE A SPECIALTY OF MANUFACTURING

GEAR WHEELS OF ALL DESCRIPTIONS,

WHICH ARE MADE ABSOLUTELY PERFECT WITH OUR

PATENT MOULDING MACHINE.

FOR PHOTOGRAPHS, PRICES, AND DESCRIPTION, ADDRESS

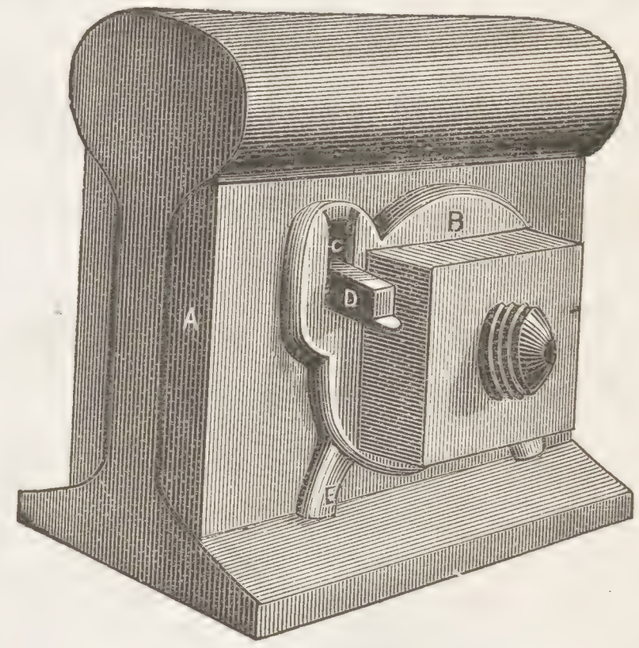
NEW-YORK STEAM ENGINE CO.,

98 CHAMBERS STREET, NEW-YORK.

PURDIE'S PATENT

Safety Washer,

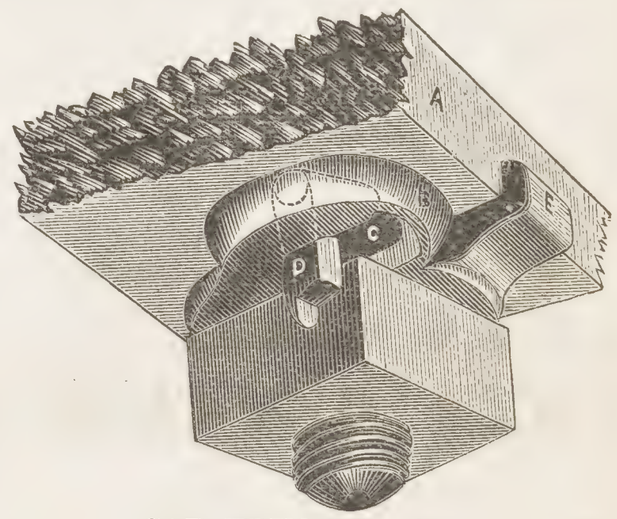
A Positive Nut-Lock, made of Malleable Iron.



For FISH PLATE.

EXPLANATION OF CUT.

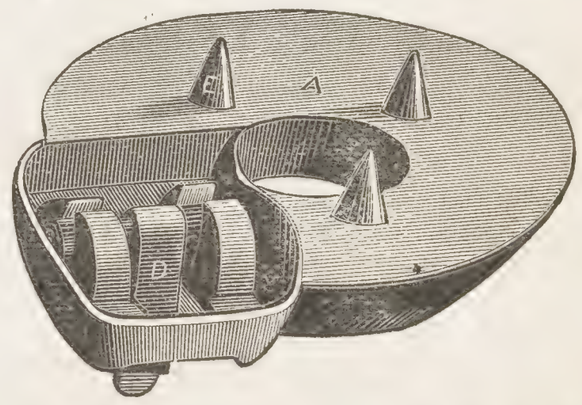
A, Fish plate. *B*, Washer, with projecting feet. *C*, Cavity into which the dog, *D*, swings, on screwing up the nut. *D*, Pivoted dog which falls by side of nut when screwed home.



CAR TRUCK Washer.

Adapted for use on fish-plate bolts, car trucks, wagons, mowing machines, wood-work of all kinds, or for any purpose where bolts and nuts are used.

Cheap, Effective, and Durable.



Reverse side for WOOD-WORK, showing Method of Pivot Swing.

Will fit on old or new work, no alterations or special tools needed, requiring no rubber or wood for compressing or bending to hold the nut. The dog being in position to lock at any time required, by turning down by the side of the nut when screwed home; should the bolt or thread give any, so as to become loose, the dog will still hold the nut from turning back, and the nut can be screwed up as readily as by the old method.

Have been practically tested for two and a half years on many Railroads, giving unqualified satisfaction, one Railroad alone having them on over 2,500 cars.

Cast-iron washers for timber or bridges furnished to any size or weight.

Samples and price-lists forwarded on application to

JOHN PURDIE,

MANAGER OF

Safety Washer Manufacturing Company,

No. 311 MAIN STREET,

BUFFALO, N. Y.

J. F. SULLIVAN,

DESIGNER AND ENGRAVER ON WOOD

No. 23 JOHN ST. NEW YORK

SOLID HEAD

NICKEL-PLATED SCREWS.

ADAMS NICKEL-PLATING and MFG. CO.

South Windham, Ct.

THE

PETERSBURG CAR COMPANY,

Petersburg, Va.,

Are now ready to receive orders for all kinds of

FREIGHT CARS.

These works are supplied with the most improved machinery, and have switch connections with broad and narrow gauge. They are prepared to furnish Rolling Stock with the utmost promptness, of the best materials and workmanship, and at the lowest prices.

T. L. H. YOUNG, President. **JOHN W. FLEMING, Superintendent.**

ATLAS WORKS,

28th Street, Pittsburgh, Pa.

Make a ***Specialty of Freight Car Forgings*** and ***Castings*** delivered to Shops. Also ***Locomotive Cylinders, Frogs and Switches.*** Address,

THOS. N. MILLER, President.

PLANING AND MATCHING MACHINES

UNIVERSAL WOOD WORKERS

TRADE MARK

WOOD WORKING MACHINERY.

BENTEL, MARGEDANT & CO.

HAMILTON, OHIO.

Send for Catalogue and Price List.

CRANK PLANERS.

Superior Design and Workmanship, Extra Heavy (1400 lb.)

DOWN, ANGULAR & CROSS-FEED,

TO PLANE 12x16x15.

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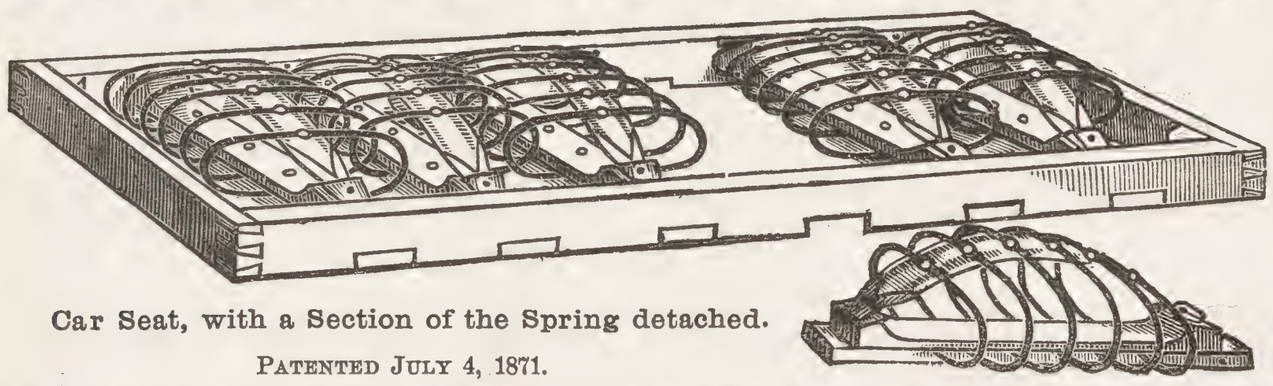
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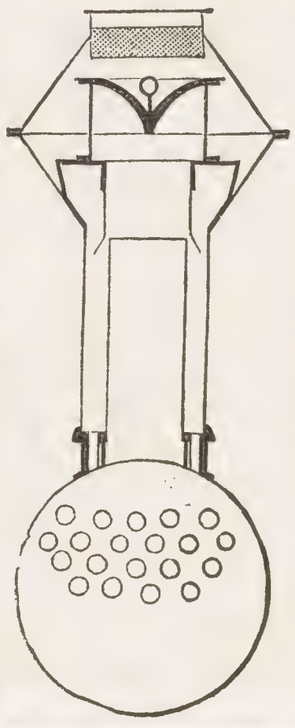
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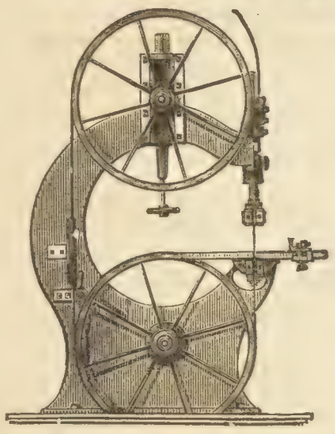
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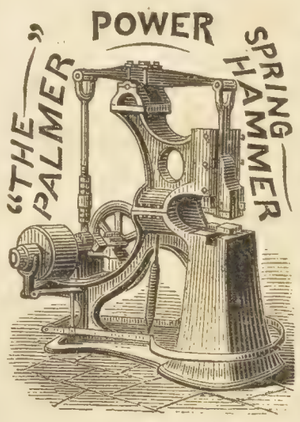
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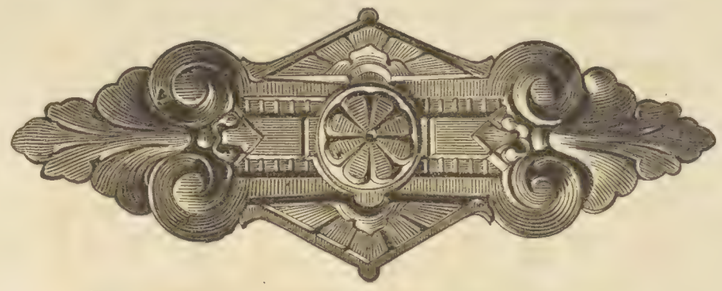
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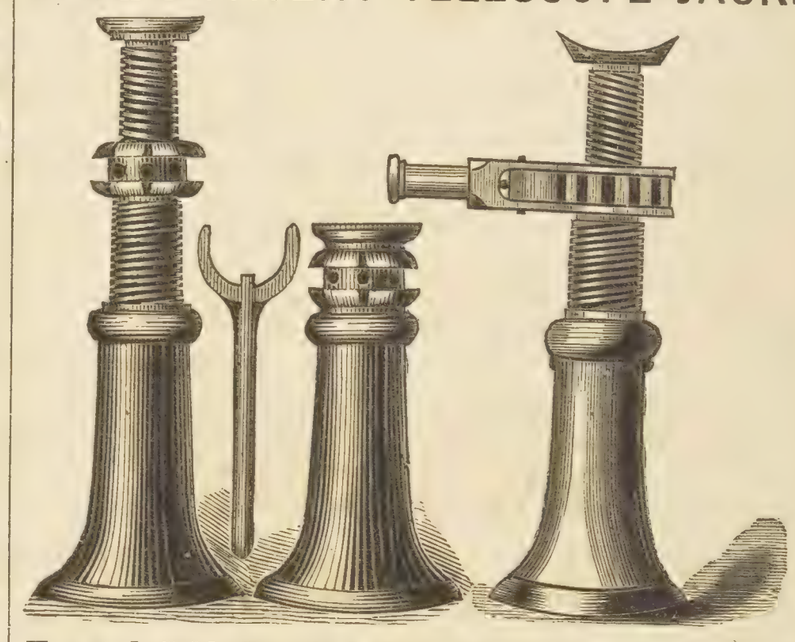
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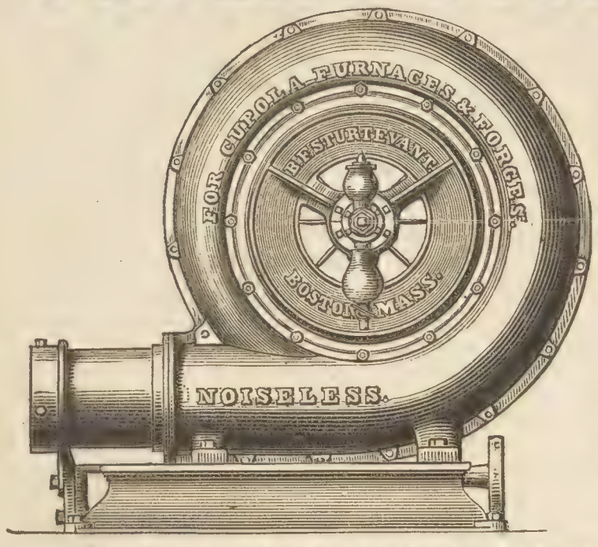
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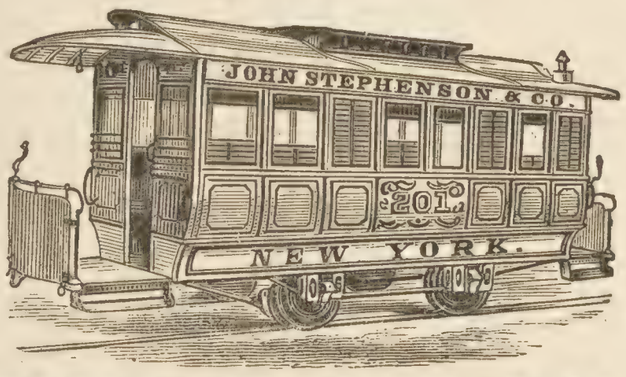
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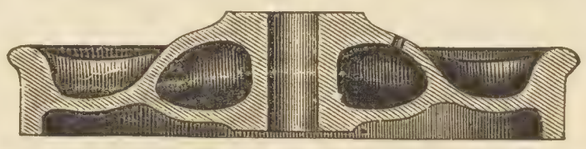
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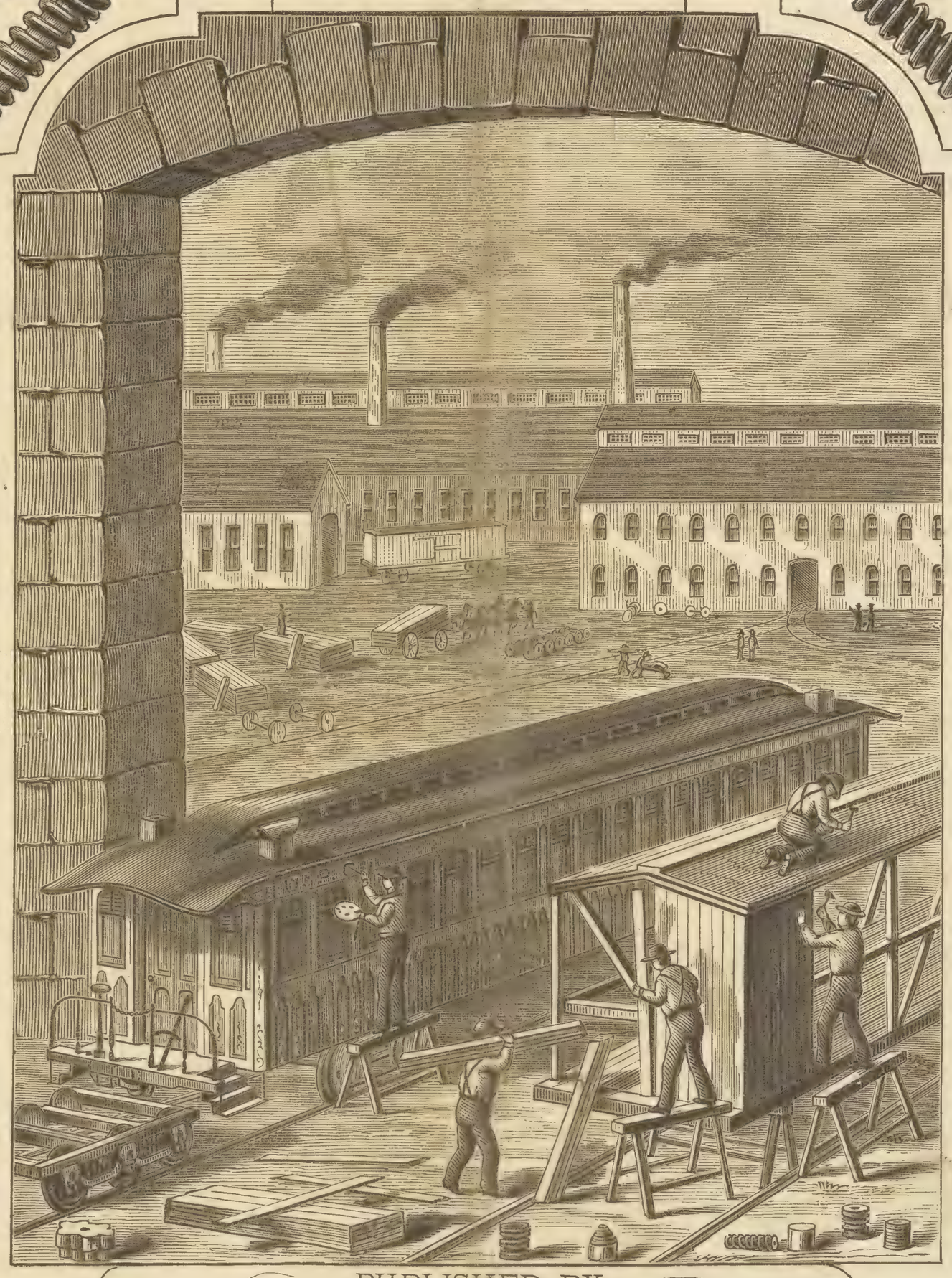
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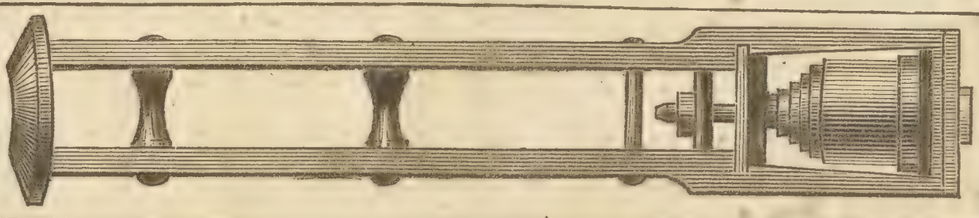
Vol. VI. JULY, 1875 No. 7.



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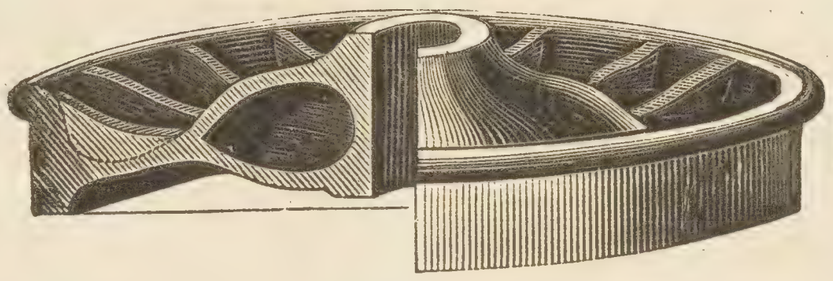
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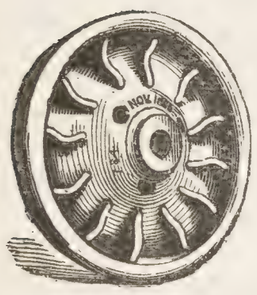
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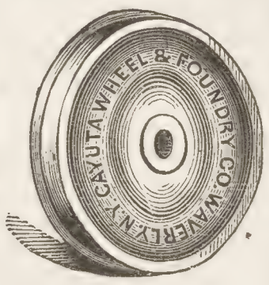
WHEEL and FOUNDRY CO.,

WAVERLY, N. Y.

MANUFACTURERS OF



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FOR

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WHEELS FITTED TO AXLES,

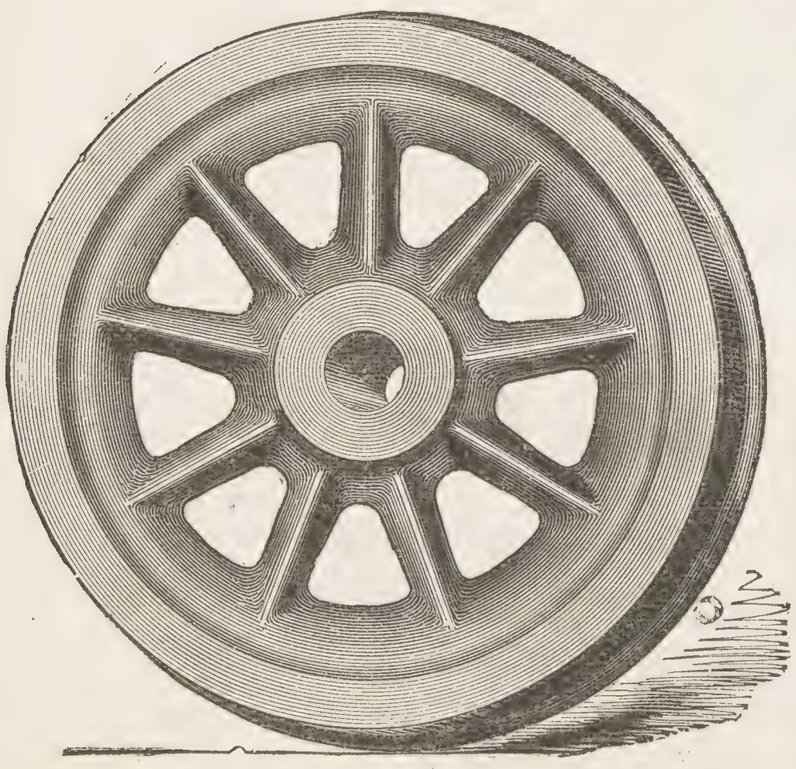
AND AXLES FURNISHED, IF DESIRED.

CASTINGS for all kinds of CARS, MINE CAR WHEELS, ETC.

MOSES LYMAN, President. W. W. SNOW, Vice-President. M. LYMAN, Jr., Treasurer.
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Baltimore Car-Wheel Company,

OFFICE, 15 SOUTH STREET.



Manufacture Wheels

FOR

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WITH OR WITHOUT AXLES.

WHEELS

OF ALL PATTERNS

MADE TO ORDER,

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This Company using strictly Baltimore Charcoal Iron, which has no superior and few equals, for making Car-Wheels,) and annealing their Wheels by the most approved process, warrant them free from strain, and equal in tenacity and uniformity of chill to any made.

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Patent Coupling,

FOR FREIGHT CARS.

First. It is self-coupling; perfectly simple; requires no pins; always sure and couples readily with any car having the ordinary draw-bar.

Second. The expense is but a trifle more than the ordinary coupling, and will be saved in pins and links alone in a very short time, there being a link always in reserve, ready for use, without liability of being lost or stolen.

Third. The saving of time is also a great consideration, as the engineer alone can couple a train of cars in much less time than with the aid of two or three men with the ordinary coupling.

Fourth. There is no going between the cars to shackle or unshackle; *it is entirely safe, always ready, always sure.* To companies desirous of testing the coupling, one or more castings will be furnished gratuitously, for trial.

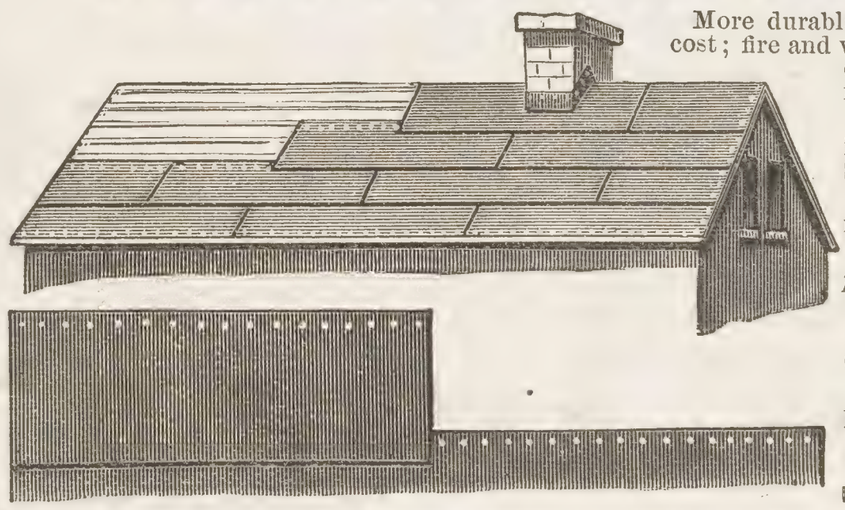
The Boston and Albany Railroad Co., after a thorough trial, being satisfied of its utility, have purchased the right for their road, and we are permitted to refer to the officers and employés of the road, who have given attention to it.

For further information respecting it, address

WILLIAMS, PAGE & CO.,

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EGYPTIAN ROOFING.



More durable than tin; one-half the cost; fire and water-proof; will not run or crack; for steep or flat roofs.

Unequaled for Covering Railroad Cars and Steamboat Decks.

Can be laid by inexperienced persons.

Roofing Shipped to any part of the Country.

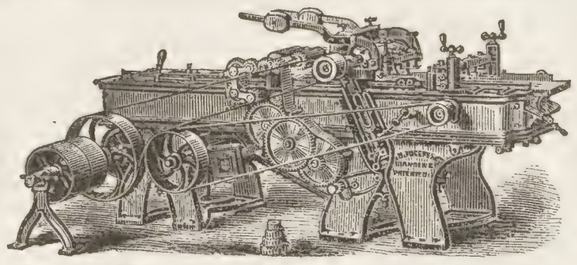
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FACTORY,
Berks St., above Ninth,
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(Take Arch, or Race and Vine Street Cars.)

Steam Hammers, Drops, etc. Engine Lathes, Axle Lathes, Cut-off and Centreing Lathes, Patent Screw-Cutting Lathes, Planing and Slotting Machines, Wheel Borers and Wheel Pressers, Upright Drills, with Patent Universal Tables, Radial Drills.



FACTORY: NORWICH, CONN.

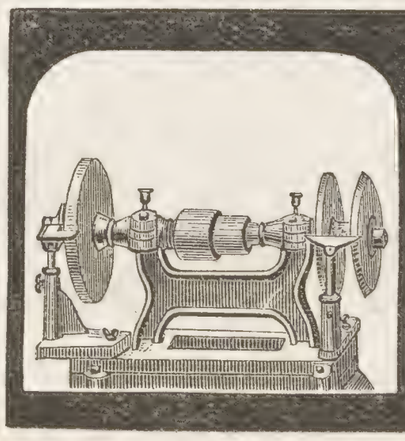
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MANUFACTURERS OF

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Hitchcock Car Ventilator.

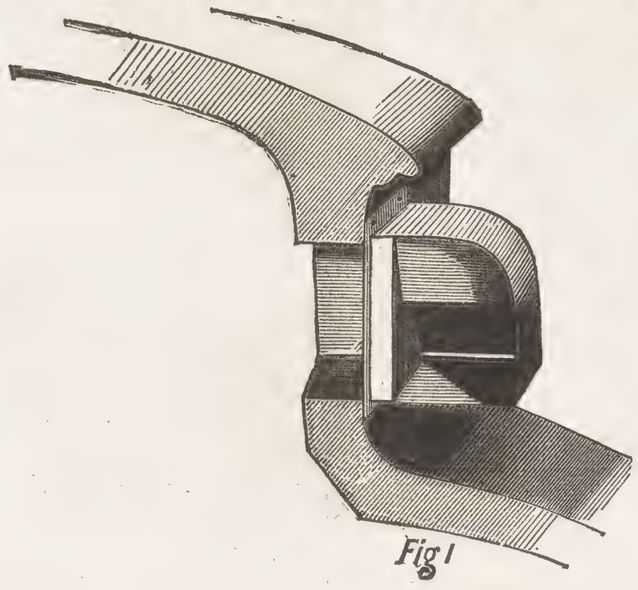


Fig 1

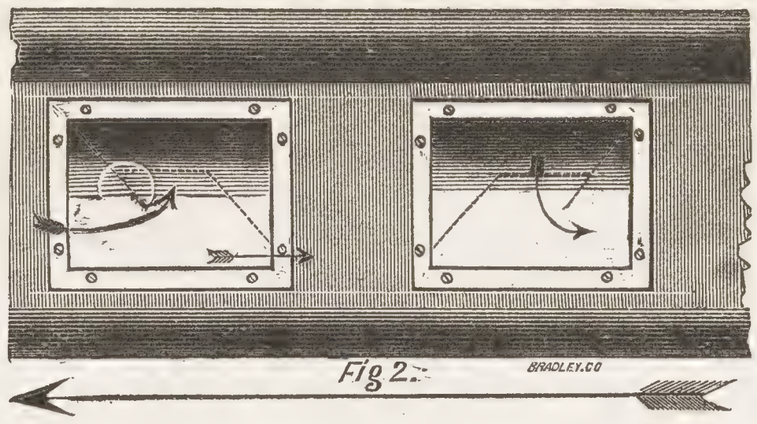


Fig 2.

THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place, it is always in readiness, and runs itself independent of all employees.

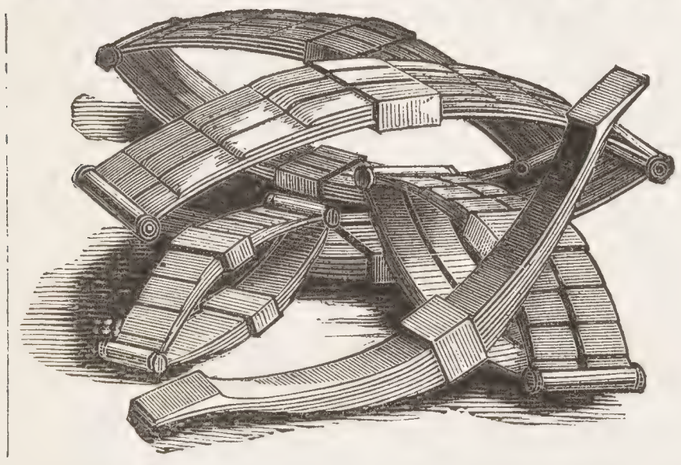
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Proprietors and Manufacturers.

ROBERT HITCHCOCK, Inventor.

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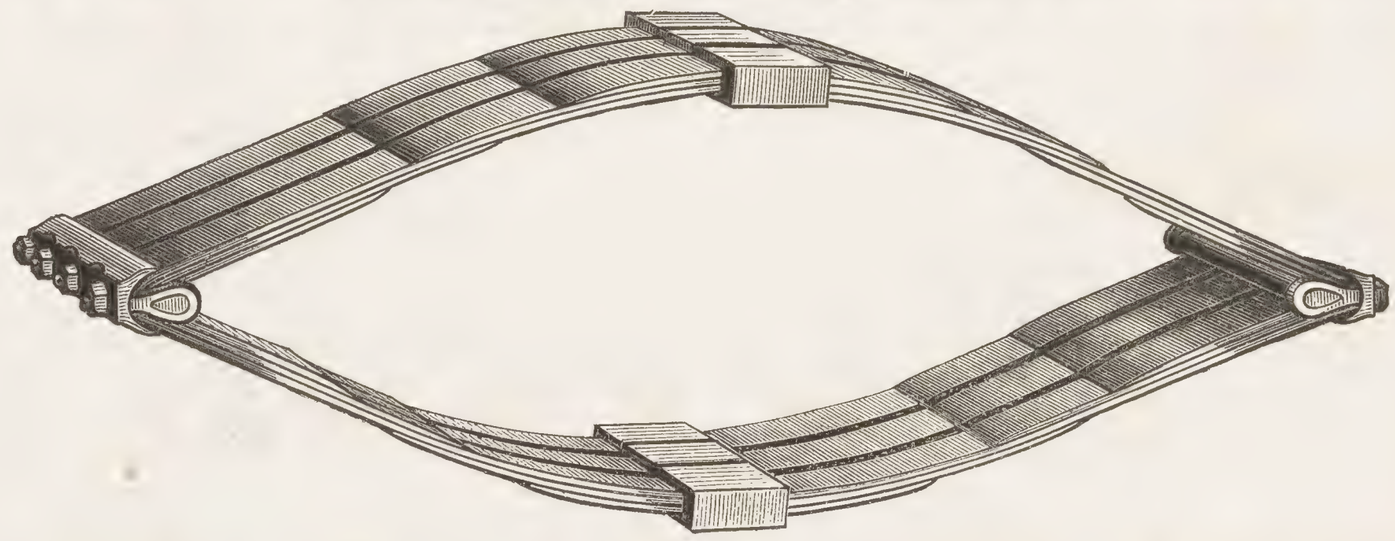
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Our own manufacture; light, extra tempered, and made of best material. Equal to any in the market.

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For Freight or Passenger Service.

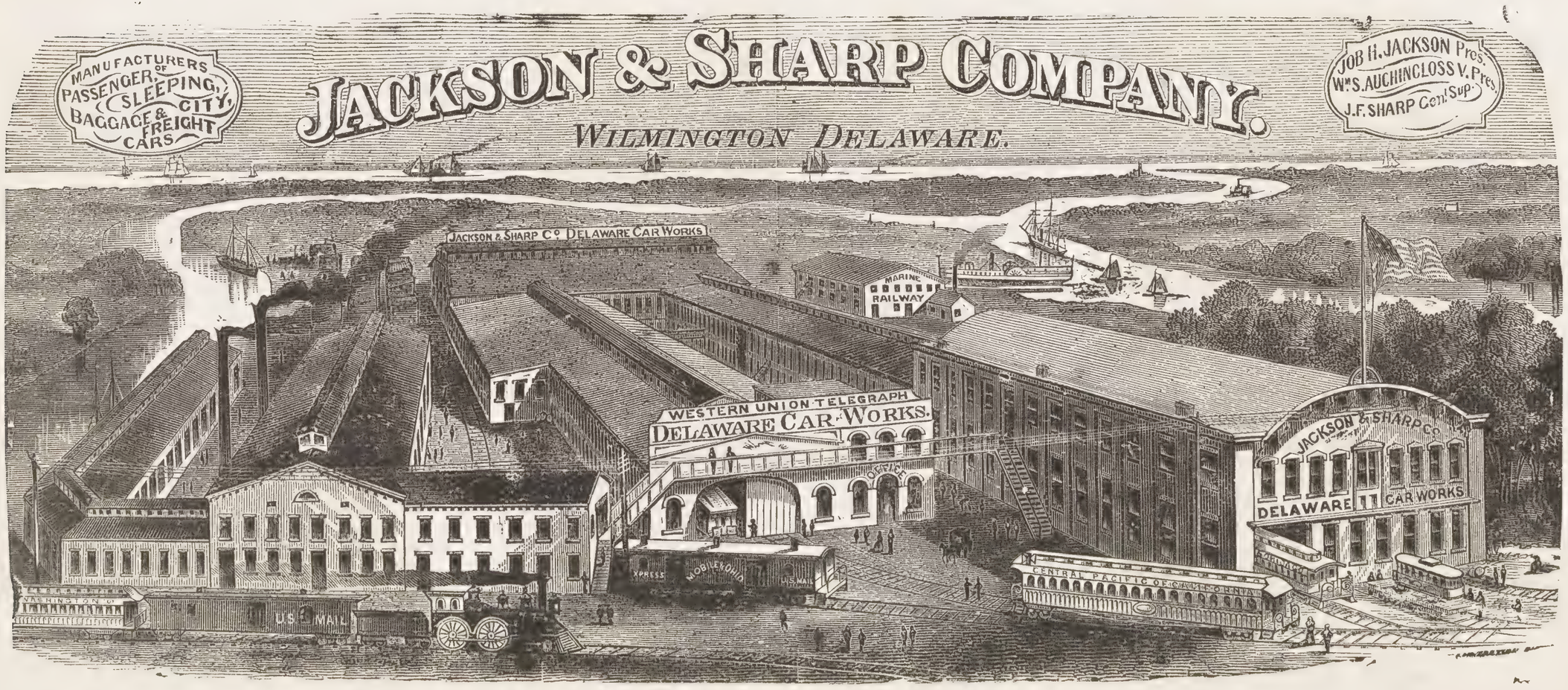


A continous leaf or bed-plate upon which all the short leaves work, securing a uniform pressure. Equally durable with ordinary elliptics, and saves thirty per cent of dead weight. In successful operation on a number of roads. Made of best cast steel. CHEAPER, LIGHTER, MORE ELASTIC.

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DELAWARE CAR WORKS.

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Steel Wire Broom AND Brush Works

MANUFACTURERS OF

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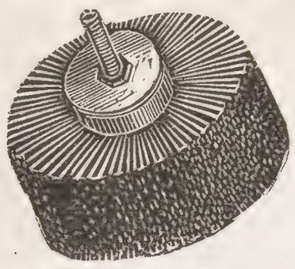
Boiler Flue and Tube Brushes,

ALSO

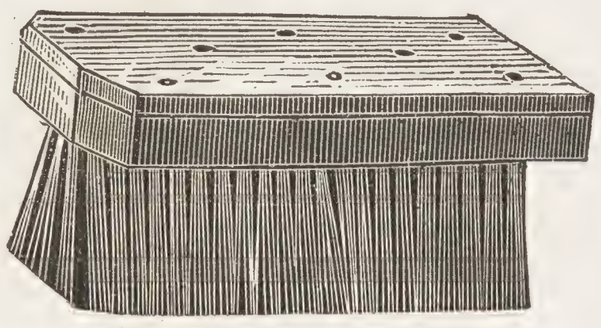
STEEL WIRE SWEEPING BROOMS.

These goods are used by all the principal Railroads, Manufacturers, and Foundries throughout the United States and Canada. They are made of the very best English Refined Spring Steel Wire, and are warranted to give entire satisfaction. All orders will meet with prompt and careful attention, by addressing

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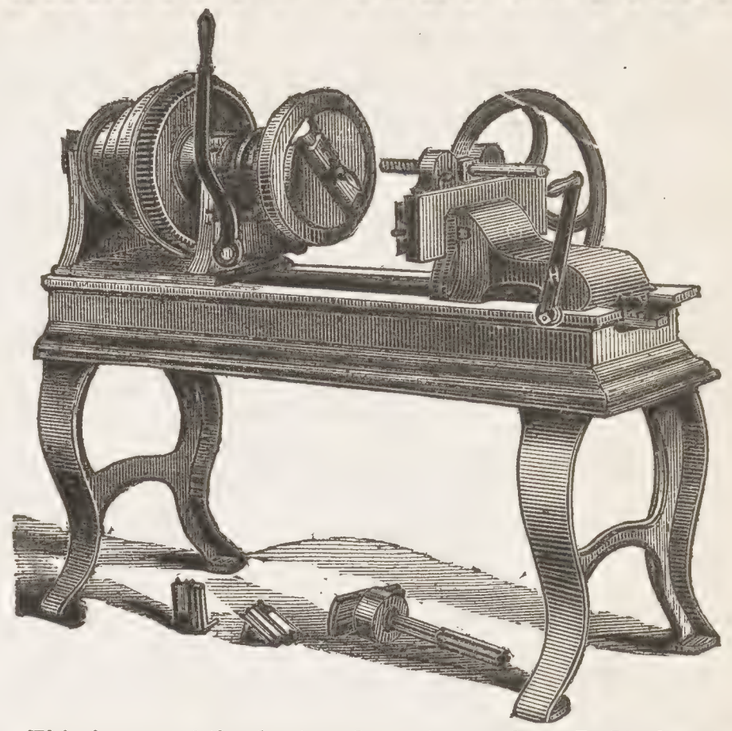


6-inch Boiler Flue Brush.



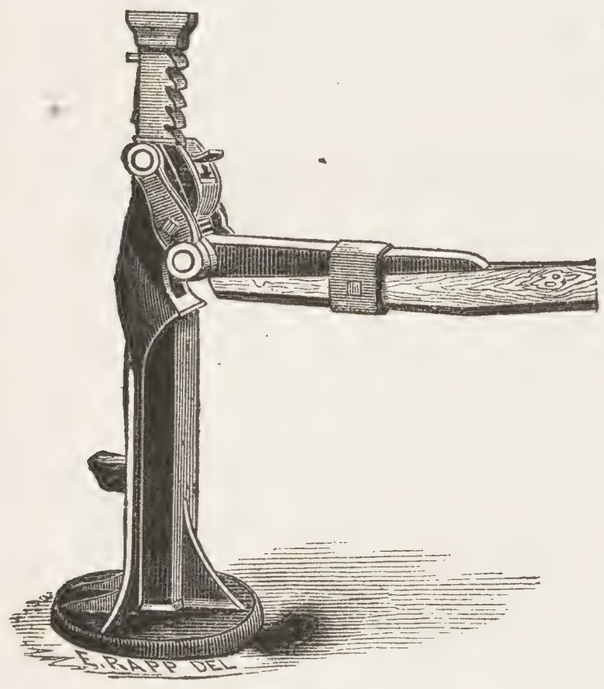
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This is one of the best and most complete ***Bolt-Cutting Machines*** in the market. It will cut all sizes, from ¼ upward to 3 inches, and has no equal in practical efficiency and economy of running, as well as ready adaptation to all kinds of work occurring in a Machine Shop. Two sizes are made, Nos. 1 and 2 *Send for Circular.*

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Patented Dec. 10, 1850; Patented Nov. 15, 1864; Renewed Nov. 28, 1864.

ADAPTED TO ALL KINDS OF LIFTING,

BUT ESPECIALLY TO

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Nearly all the Railroads in the United States have these Jacks in use, and the testimony in every instance shows a very great economy in

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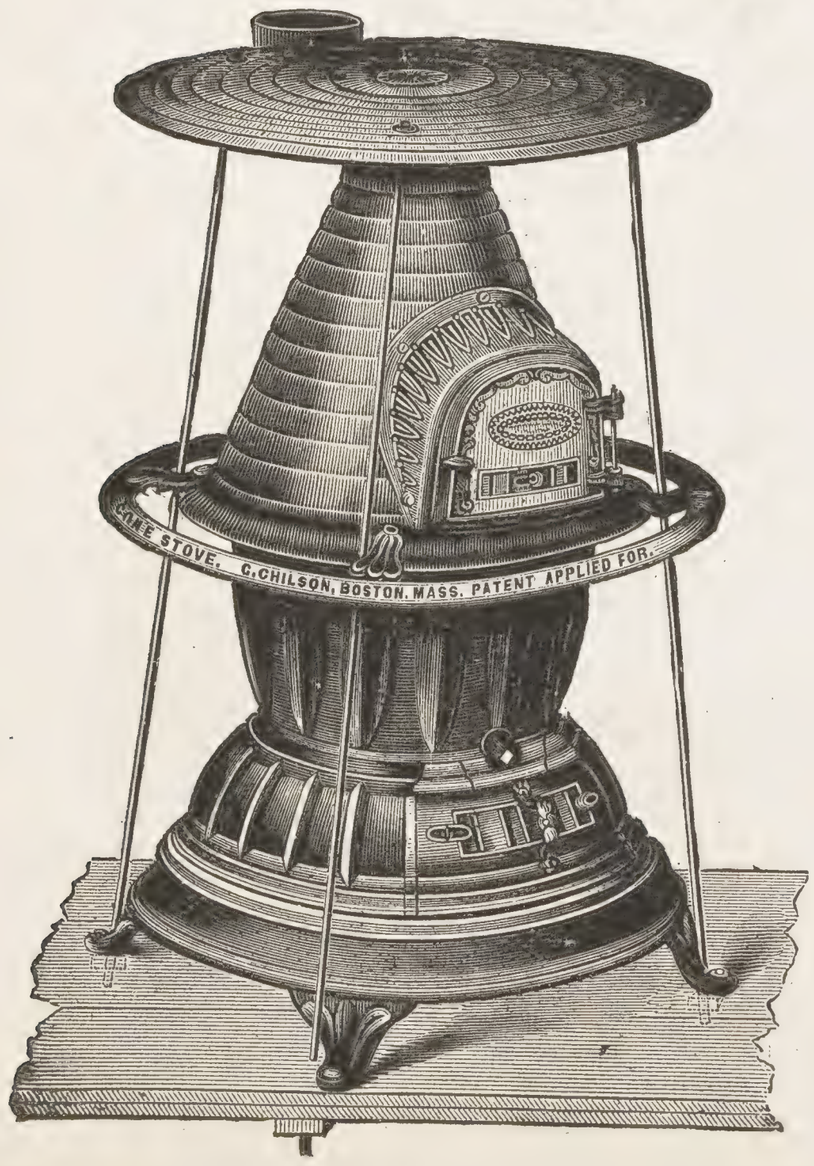
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Chilson's Patent Cone Disk Stove

ON A NEW AND MODEL PLAN.



I WOULD respectfully call the attention of Railway Managers and others interested in warming Railway Cars, Station Houses, etc., to this Stove, which has been thoroughly tested on several of our railways for a few years past, and has proved in every instance the most successful plan yet devised for thoroughly warming Railway Cars. This Stove is on a new and model plan, differing in principle and operation from all others in the United States. I claim for it *Safety, Economy, Durability, Simplicity, Cleanliness, and Beauty of Design.* Its peculiar merits may be stated as follows:

1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.
2. The broad radiating disk prevents the heat from ascending to the upper part of the car or room, but distributes and throws it down to the floor, thoroughly warming the lower currents of cold air in the car or room for a great distance around the Stove, thus securing the long desired object of making the *lower part of the car and floor comfortably warm, especially for the feet.*
3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stoves.
4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.
5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*
6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories, Stores, Offices,* RAILROAD CARS, and STATION HOUSES, *School Rooms, Workshops, etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

The BOSTON AND PROVIDENCE RAILROAD COMPANY have over two hundred of these Stoves in use, and the BOSTON AND ALBANY and several other Roads are adopting them, with the most perfect success.

BOSTON AND PROVIDENCE RAILROAD CORPORATION,
Superintendent's Office, Boston, April, 1873.

GARDNER CHILSON, Esq.: *Dear Sir:* We have about two hundred of your new "Cone" Disk Stoves in use, (a part of them for nearly five years,) for warming Passenger Cars and Stations. I can truly say that they have given entire satisfaction. These Stoves possess many important advantages over any other we have ever used, viz.: for warming the floor and displacing the cold air in the lower part of the car, whereby they are rendered much more comfortable, especially for the feet, than by any other plan known to us. The Stove is more economical in the consumption of fuel, more substantial in construction, and consequently requiring less repairs than any other in use, and so securely constructed as to prevent fire from getting out of the stove even should the car be *overturned.* I cheerfully give my testimony in favor of this Stove, and commend it to all Railroad Managers.

Yours, etc.,
A. A. FOLSOM, *Superintendent.*

Numerous other testimonials received from Railroads and other persons having these Stoves in use in Halls, Stores, etc., may be seen at office. Bolts are not required except for Cars and Steamboats.

Chilson's Improved Celebrated Cone Furnaces, for setting in Brickwork or in Portable Casings, Chilson's Unrivaled Double-Oven Brick Cooking-Range; Chilson's New and Splendid Arlington Portable Range; Chilson's very Superior Arlington Cooking Stove; Parlor, Office, and Store Stoves, Parlor Grates, Registers, Ventilators, etc.

Special attention given to putting up Furnaces and Ranges, and the ventilation of buildings in any part of the country.
☞ Nothing but strictly first-class work is manufactured by me. ☜

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FOUNDRY AT MANSFIELD, MASS.

GARDNER CHILSON.

RAWLINS' METALLIC PAINT,
WYOMING.

Warranted Fire, Water, and Weather Proof.

Will cover more surface and outwear any paint manufactured.

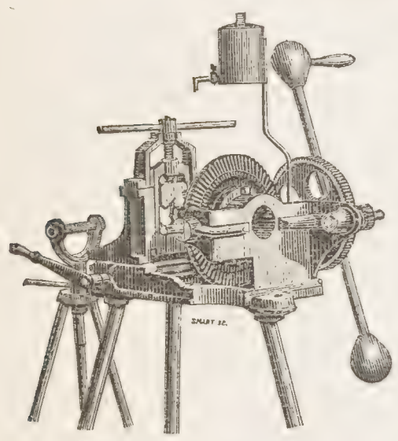
CHICAGO, BURLINGTON, AND QUINCY RAILROAD,
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RAWLINS' METALLIC PAINT CO.

GENTLEMEN: I have had your IRON PAINT in test for about six months, and find it one of the best, if not the best, Iron Paints I have ever seen. *I put two coats of it, mixed with boiled oil, on a piece of sheet-iron, and buried it in* STRONG BRINE, *about six months ago, and it has stood the test, and* DOES NOT SHOW ANY SIGNS OF RUSTING THROUGH THE PAINT. I have also used it on Locomotive work, and find that it COVERS FAR MORE SURFACE than any Iron Paint I have used.

Very respectfully yours,
D. C. COOLEY.

CHASE'S
Pipe-Cutting and Threading Machine.
(W. D. CHASE'S PATENT.)



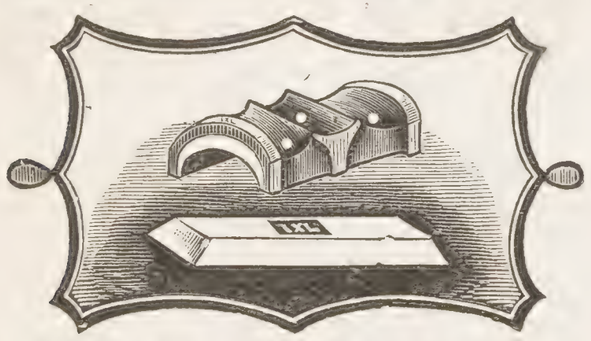
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Send for Circular.

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I X L ANTI-FRICTION METAL
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EMPIRE PORTABLE FORGES
NO BELTS, BELLOWS OR CRANKS;
THE BEST MADE.
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Empire Portable Forge Co. Troy, N.Y.
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Read Advertisement of
BRIDGES' LUBRICATOR,
Page x.

IRON CLAD PAINT.



Address IRON CLAD PAINT COMPANY,
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This Company owns and manufactures under WM. GREEN'S several patents, and is the only Company in the world that makes Paint from pure hard Lake Superior Iron Ore, such as is used in furnaces for making Pig Iron.

The most Economical, Most Fireproof,
Most Waterproof, Most Durable,
and Most Useful Paint made.

Used by L. S. & M. S. RY.	I. & ST. L. R. R.
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T. W. & W. RY.	L. S. & T. V. R. R.

Etc., etc.

OFFICE OF PURCHASING AGENT
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GENTLEMEN: Your "Metallic Paints" known as "*Iron Clad Paints*" have, in the past six years, been extensively used and thoroughly tested by this Company, as to their *covering capacity, durability, and resistance to atmospheric changes*—latter "paint destroyer"—the most difficult to overcome in outside paints. We can emphatically accord them the highest position over any paint heretofore produced, for Cars, Roofs, Stations, Bridges, etc. The monthly increase of our orders is the best evidence that the Paint is constantly growing in favor with our mechanics.

Very respectfully yours,
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Gen'l Purchasing Agent L. S. & M. S. R. R.

Brinckerhoff, Turner & Co.,
Manufacturers and Dealers in
COTTON DUCK,
For Car Covering and Car Seats,

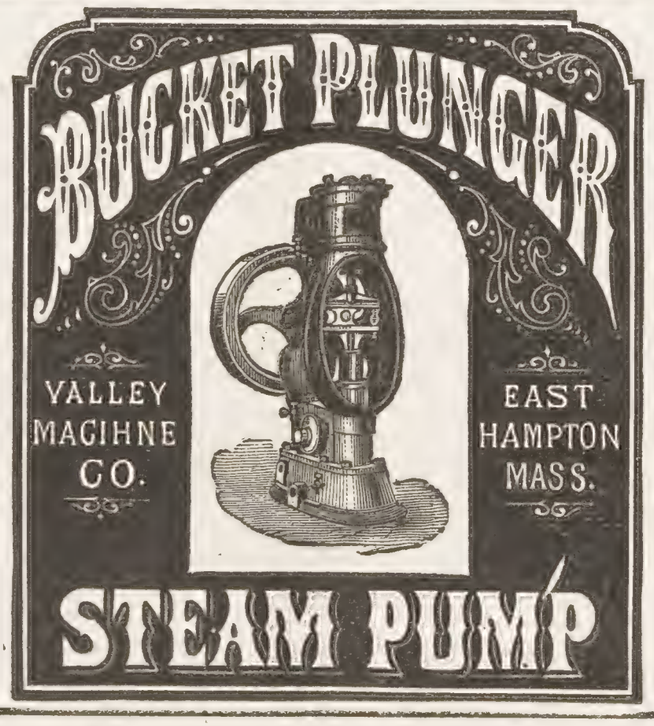
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A full supply, all Widths and Colors, always in Stock.

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OSWEGO, N. Y.,

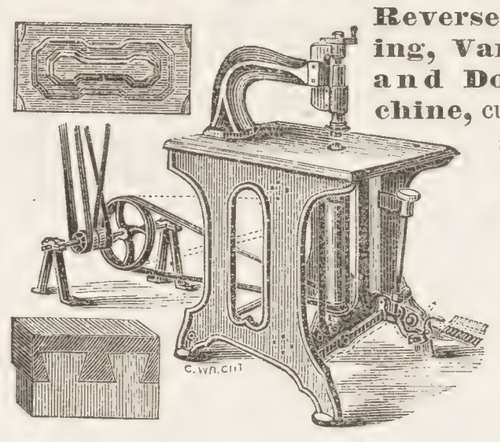
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Box, Platform and Coal Cars

Prices and terms to suit the times. Orders solicited. Address,

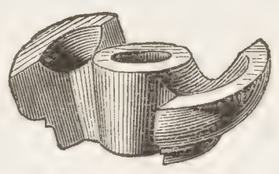
WM. H. HERRICK, Proprietor.

BOULT'S PATENT



Reverse Motion, Paneling, Variety Moulding and Dovetailing Machine, cuts Panels of any design or style of Mould in the solid wood, with neatness and dispatch. Is a first-class Shaper, Edge and Scroll Moulder. Does general Dovetailing with thick or thin stuff.

Simple, Durable, and Efficient.



☞ Send for Pamphlet and sample of work.

Improved Solid Steel Cutters for all kinds of Variety Moulders made to order, and warranted by the

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WALL'S MAGIC RENOVATOR.

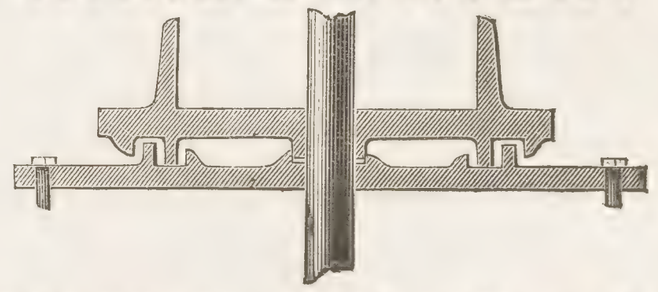
For Cleaning and Polishing Gold, Silver, Nickel, Brass, Copper, and Lacquer Gilt on Metals. A chemical liquid free from acids, which will remove all tarnish, dirt, and grease, from whatever cause, almost instantaneously, and without injury to the metal.

Price, per gallon, $5; in pint bottles, $1; ½ pint, 50 cents. Discount of five per cent on orders for ten gallons. A liberal commission to Agents.

Samples sent on application to

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CENTER OR TRANSOM PLATE
FOR RAILWAY CARS,

With Oil Receptacle for Bearing-Ring to work in. They are acknowledged to be the best in use. See description and drawings in CAR-BUILDER for January, 1874.

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ST. CHARLES CAR CO.

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FREIGHT CARS,

built in the most approved manner and of the best material. Orders respectfully solicited. Address,

ST. CHARLES MFG. CO.,
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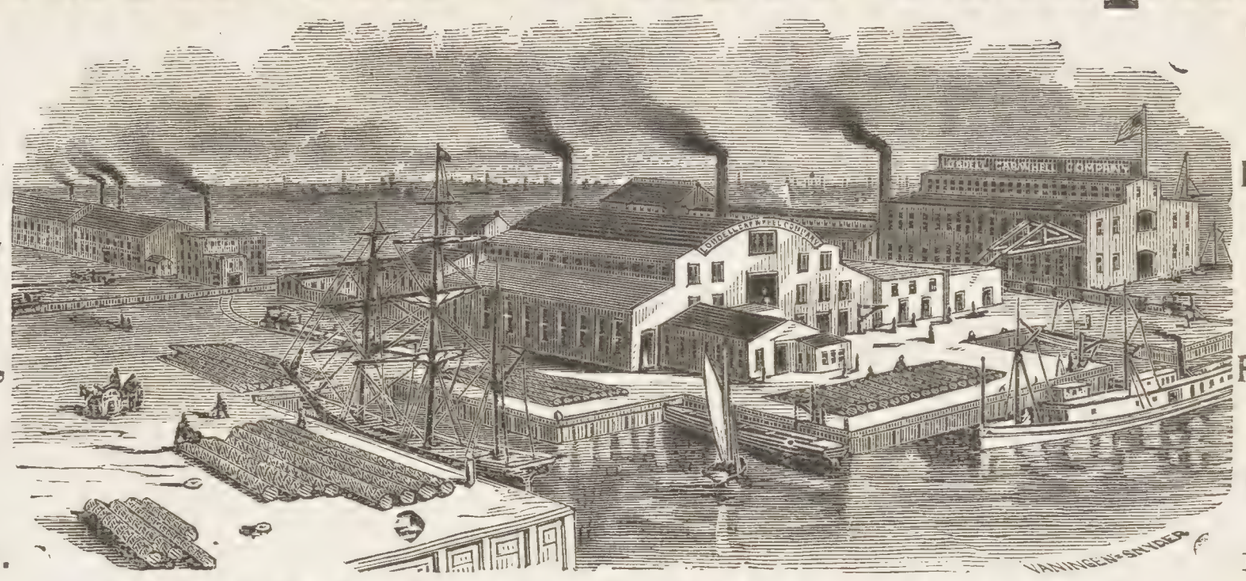
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Having perfected and patented our machinery, we guarantee all Moss put up by us to possess the following qualities—*full length of fibre, freedom from dust, strictness of grade, preservation of elasticity, and exactness of weight,* and used with great success by the leading carriage makers, upholsterers and railroad companies in the United States, as the most economical substitute for curled hair.

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RAILWAY CAR VARNISH.

Elastic, pale, and extremely durable, possessing great brilliancy of lustre, and producing a hard, fine **finish,** resisting in the highest degree effects of time and exposure. Should be used over our Rubbing.

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Hard-drying, works freely on large panels, will not sweat out, and is very desirable where a fine and durable surface is requisite on which to finish.

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Dries readily, with brilliant lustre; durable under severest exposure in any climate.

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A hard-drying Varnish for inside work; is very light-colored, flows well, and dries in about 12 hours.

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Very pale, and preferable to Japan as a drier for delicate colors.

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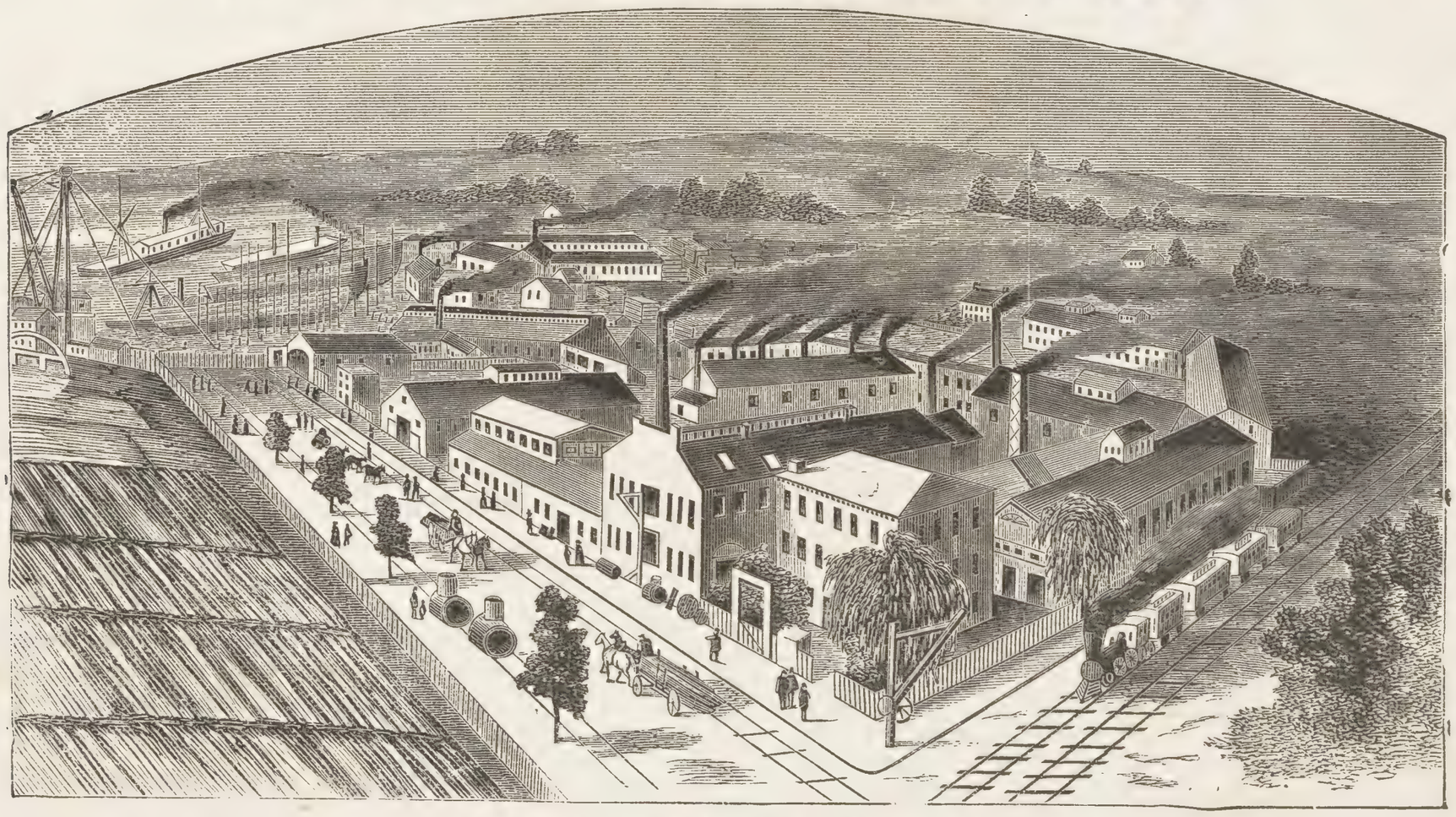
These **VARNISHES** are made with the greatest care and skill, from the best grade of stock, and designed especially for

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They dry hard, and resist effectually the severest exposure to action of **Cinders, Smoke, or Climate,** having been tested for many years by the leading Railroads of this Country and have proved, for **brilliancy** and **durability,** fully equal to any of either Home or Foreign Manufacture.

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BUILD ALL KINDS OF

RAILROAD CARS:

FIRST and SECOND-CLASS DRAWING-ROOM, SLEEPING, BAGGAGE, MAIL, and EXPRESS, BOX, and FLAT.

MURPHY & CO., NEWARK, N. J.,
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We call attention to the following prices of our Varnishes especially adapted to Railway Uses, and submit that they combine more prominently than any others, the INDISPENSABLE REQUISITES for Railway Consumption. They are of heavy body, light color, quick drying, and are guaranteed to give a maximum of durability.

Wearing Body, (For Outside Finishing.)	**$5 50**
Hard-Drying Body, (For Under Coats on Cars.)	**5 00**
Rubbing Body, (For Under Coats on Cars.)	**4 50**
Inside Car, (For Interiors of Cars.)	**4 50**
Engine Finishing, (For Last Coats.)	**5 00**
Engine Rubbing, (For Under Coats.)	**4 50**
Japan Gold Size, (For Binding and Hardening Colors.)	**3 50**
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Black Enamel, (For Smoke Stacks of Engines.)	**3 00**
No. 1 Black, (For Iron-Work.)	**1 50**

UNIFORM SUPERIORITY IN QUALITY AND FIXED PRICE TO ALL will continue to characterize these goods, and Satisfaction in their use is assured.

JOHN JEWETT & SONS,

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MANUFACTURERS OF

PERFECTLY

Pure

WHITE LEAD AND LINSEED OIL.

JEWETT & SONS PERFECTLY PURE WHITE LEAD TRADE MARK

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White Lead, Red Lead,

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JOHN T. LEWIS & BROS. WARRANTED PURE WHITE LEAD. PHILADA.

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☞ READ ECKSTEIN, HILLS & CO. ADVERTISEMENT.

Page 1.

THE DISNEY CAR COUPLER,

Patented June 24th, 1874. Manufactured by

F. E. CANDA & CO.,

CHICAGO, ILL.

Fig. 1.

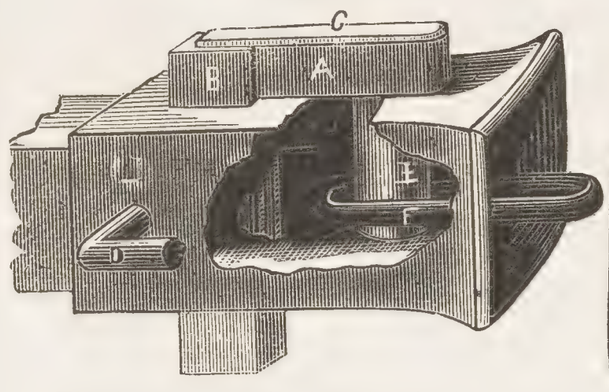


Fig. 2.

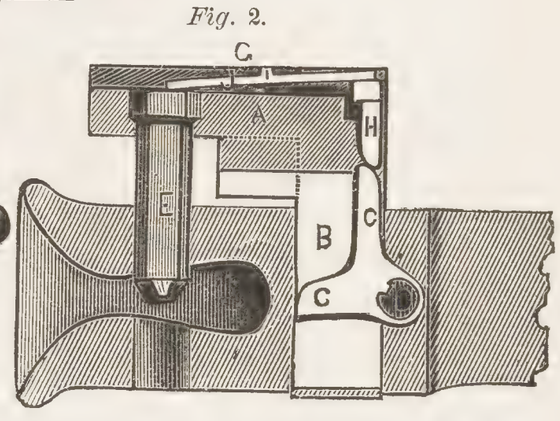


Fig. 1 represents the draw-head with a portion broken away to show the interior.

Fig. 2 represents a vertical, sectional view. *A B* we designate *The Drop*, the upper part *A* serving as the pin-holder. *D* is a lever by which the device is operated, fastened to a shaft passing through the draw-head. *C C* is a forked piece keyed to this shaft. *H* is a small loose pin. *E* is the large pin for securing the link *F*. *J* is a lever resting on the heads of pins *E* and *H*, with its fulcrum on cap-piece *G*. *Then*, when set for coupling or uncoupling, as in Fig. 2, the link *F*, in passing the mouth of the draw-head, raises pin *E*, which by lever *J* forces pin *H* against and displaces the upper arm of *C C*, allowing the *drop* to fall, carrying pin *E* with it.

From the above cuts and description it is apparent that this device combines simplicity in its construction, reliability in its working, and durability in all its parts.

We designate as points of special advantage:

That working from the side of the draw-head, it leaves no opening at the top for dirt, gravel, or accumulations of ice and snow to interfere with the working of the coupler.

That, while the link is always held in a horizontal position for entering, yet it has sufficient vertical movement to accommodate itself to cars of different heights, not exceeding a variation of six inches, without using the crooked link.

That the mouth of the draw-head is of such shape as secures the pin from all liability of bending or breaking.

That it always couples when desired, or set for coupling, and will *never* couple when not desired.

That, working readily from the top and sides of cars, there is no risk of life or limb.

That the pin can never be lost or stolen.

And further, *that* from its reliability of working, and durability of parts, combined with the device for securing it to passenger cars, makes *This Coupler* the safest and by far the most economical *Passenger Car* Coupler ever introduced.

The Disney Car Coupler, wherever tried or however thoroughly tried, has given the most perfect satisfaction, both as a Freight and Passenger Car Coupler.

For further information, address

H. C. KIBBE, 419 California St., San Francisco, Cal.,

AND

F. E. CANDA & CO., Railroad Contractors and Car Builders,

79 SOUTH CLARK ST., CHICAGO, ILL.

THE
Atlantic White Lead
AND
LINSEED OIL COMPANY,

Manufacturers of

WHITE LEAD,

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CRUSHERS OF LINSEED OIL.

ATLANTIC WHITE LEAD. PURE. WARRANTED. ROBERT COLGATE & CO.

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Robert Colgate & Co.,

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KATAHDIN CHARCOAL PIG IRON.

O. W. DAVIS, Jr., Manufacturer, BANGOR, MAINE.

SOUTH BOSTON IRON CO.'S TESTS OF KATAHDIN PIG IRON, 1874:

	Density.	Tensile strength per square inch.
No. 2 Pig Iron,	7,2002	18,894
" 3 "	7,2432	26,928
" 4 "	7,2305	30,765

Nos. 1 and 2 are soft and strong, suitable for machinery and fine castings, boiler plates and steel. Nos. 3 and 4 are close-grained and tough, adapted for steam cylinders, radiators, locomotive castings, car-wheels, hydraulic presses, etc. All grades contain less than one-tenth of one per cent of sulphur or phosphorus. Shipped by rail or water from Bangor to any part of the country.

THE NATIONAL CAR BUILDER.

DEVOTED TO THE INTERESTS OF RAILWAY ROLLING STOCK.

Vol. VI.
No. 7.

JULY, 1875.

$1.10 per Annum.
Single Copies, 10 Cents.

Ninth Annual Convention of the Master Car-Builders' Association.

THE delegates to the Ninth Annual Convention of the Master Car-builders' Association assembled on Wednesday, June 9th, 1875, at the Grand Central Hotel, in the City of New-York. The Convention was called to order by the President of the Association, Mr. LEANDER GAREY, of the New-York Central and Hudson River Railroad.

THE ROLL OF MEMBERS.

The Secretary then called the roll of members, when the following gentlemen answered to their names :

F. D. Adams,	Boston and Albany R.R.
C. A. Smith,	Late of Erie Railway.
A. Steinbach,	Philadelphia and Reading R.R.
G. W. Demarest,	Northern Central R.R.
Samuel Griffith,	Indianapolis, Cin., and Lafayette R.R.
Enos Varney,	Fitchburg R.R.
V. D. Perry,	Hartford, Providence, and Fishkill R.R.
Leander Garey,	New-York Central and Hudson River R.R.
W. R. Davenport,	Erie Car-Works.
R. S Ramsey,	Pennsylvania R.R.
M. P. Ford,	Pittsburg, Cin., and St. Louis R.R.
John Lightner,	Boston and Providence R.R.
M. C. Andrews,	Late of New-York and New-Haven R.R.
M. W. Dickerman,	Manchester and Lawrence R.R.
Ambrose Ward,	Pennsylvania R.R.
Samuel W. Myers,	Pennsylvania R.R.
W. F. Smith,	Cleve., Col., Cinct., and Ind. R.R.
John McVay,	Pittsburg, Cin., and St. Louis R.R.
A. Langmaid,	Northern New-Hampshire R.R.
E. Lockwood,	Late of Pennsylvania R.R.
W. B. Snow,	Illinois Central R.R.
Willis Davis,	Empire Transportation Co.
J. H. F. Wiers,	Atlantic and Great Western R.R.
George Rowe,	New-York Central and Hudson River R.R.
J. W. Holmes,	Atlantic and Great Western R.R.
John Kirby,	Lake Shore and Michigan Southern R.R.
B. K. Verbryck,	Chicago, Rock Island and Pacific R.R.
I. W. Van Houten,	Pennsylvania R.R.
W. W. Wilcox,	Chicago, Burlington and Quincy R.R.
H. A. Webster,	Dutchess and Columbia R.R
Wilson L. Gill,	Columbus Car Works.
W. T. Hildrup,	Harrisburg Car Works.
J. T. Leighton,	New-Haven Car Works.
Edward Mahony,	Harlem and Hollingsworth Co.
David H. Baker,	Pennsylvania R.R.
W. E. Chamberlain,	Boston and Albany R.R.
S. A. Davis,	Boston, Lowell and Nashua R.R.
George Dunham,	Union Line and Transportation Co.
J. F. Elder,	Pennsylvania R.R.
Tho. D. Furguson,	Pittsburg, Cin. and St. Louis R.R.
M. N. Forney,	*Railroad Gazette.*
C. E. Garey,	New-York and Harlem R.R.
A. Gleason,	Old Colony and Newport R.R.
C. J. Holbach,	Catawissa and Foglesville R.R
George Hackett,	Central R.R. of New-Jersey.
J. B. Hill,	Erie Railway.
D. Hoit,	New-York Central and Hudson River R.R.
D. A. Hopkins,	Erie Railway.
S. S. Knapp,	Lake Shore and Michigan Southern R.R.
S. H. McElroy,	Houston and Texas Central R.R.
E. A. Olmstead,	New-York Central and Hudson River R.R.
W. E. Partridge,	*Associate Member.*
B. N. Phelps,	New-York Central and Hudson River R.R.
D. C. Richardson,	Boston and Maine R.R.
J. Spivy,	Fourth Avenue R.R. (N.Y.)
J. P. Somerby,	Eastern and Maine Central R.R.
T. B. Stewart,	Hartford and Weatherfield R.R.
J. J. Traver,	Adirondack R.R.

The minutes of the last meeting were approved.

THE PRESIDENT'S ADDRESS.

Master Car-Builders and Gentlemen of the Convention : I am happy to meet you this 9th day of June, 1875, and congratulate you upon the large numbers present at this our ninth annual meeting. It is an indication of an increasing interest in, and an appreciation of, the advantage derived from interchange of thought and experience with those in the same line of business under different circumstances and from various localities.

A few master car-builders report their superior officers as showing no interest in the proceedings of our meetings, and claim that railroad companies should send their men and pay their expenses. I would ask if there is one master car-builder present who would employ a man to superintend manufacturing, and then send him yearly to a convention, paying his expenses for the purpose of qualifying him to perform his duties. While the railroad stockholders and managers, with the public, are largely though indirectly benefited by our meetings, you as master car-builders should add to your stock of knowledge that which should enable you to fill your positions with profit to yourselves and satisfaction to your employers. It is for us to make our meetings so interesting and instructive that railroad companies can not afford to have their men absent from such meetings, and the constant improvements which the new experience of our members introduces makes this no difficult task.

I would present to you a few of the reasons why we should meet in convention at least once a year. The master car-builder is placed in a trying position, at the head of one of the most important and expensive departments connected with railroads. We are yet in the early history of railroad management, without precedents by which we can be guided, and the constant improvements in the construction and equipment of cars call for all the information we can obtain by consultation and discussion to enable us to succeed. This is an age of improvement and progress, and the man who stands still in this enterprise and thinks there is nothing more for him to learn, will soon be left behind and forgotten, and the man who stays at home, confining himself to his shops year after year, without mingling with other master car-builders from different sections of the country, availing himself of their experience, thereby keeping pace with the age, will soon be swept out of the way to make room for some one better qualified.

While other railroad rolling-stock never leaves home, the cars are transmitted from road to road, until they are thousands of miles from the shops where they belong, when the car-inspector finds they need repairs, and makes them from the nearest car-shop ; and here you find a necessity for uniformity in those parts of cars which require the most frequent repairs ; and this calls for our association and conventions. If you call to mind the first-class passenger-car of twenty years ago, and compare it with the palatial drawing-room, hotel, and sleeping-cars of to-day, by which travelers are transported thousands of miles, dined, and lodged, without detentions or change of cars, you must realize that the improvements in the construction of cars have outstripped the improvements in all other departments connected with our railroads.

But the imperative demand to-day is a reduction of expenses. The day of extravagant prices and inordinate profits is passed. We are now in a transition state, in which the adjustment of values is to be accomplished. Many business enterprises must fail and pass away in the sharp competition which lower prices will force upon them. It is impossible to say how far this readjustment of values has been the cause, within the past few months, of placing many railroads in the hands of receivers, and leaving others greatly embarrassed.

Among the most important questions of the day are quick transit and cheap transportation. The latter problem has drawn together the farmers and manufacturers, and led the boards of trade at our commercial centres to meet for consultation. The important subject discussed is how to obtain cheaper and quicker transportation. That the master car-builders will perform an important part in the solution of this problem, is unquestionably true.

Gentlemen, are you prepared to act your part ? Have you at your command the information required ? If not, here is a reason why you should meet together and discuss these important subjects. Since we adjourned at Cincinnati one year ago, the master car-builders have been called upon to reduce the cost of maintaining their departments. I would impress upon each one of you the importance of knowing just how and where the labor and materials furnished you are expended. The man who can furnish his superior officers with a detailed statement, showing how the labor and materials are used, is prepared to advise where reductions can, and where they can not be made with safety and economy. The amount of dead weight to paying weight hauled over our roads should receive careful consideration at this time. Our Committee on Dead Weight, in their report presented at the Fifth Annual Meeting, held in the city of Richmond, Va., four years ago, could not recommend the building of lighter freight-cars, if they were to run in large trains or with heavy cars ; and many of you can testify to the failure, whenever the attempt has been made, to use light-built cars in heavy trains. I think it has been fully demonstrated that a return to light-built cars would force railroad companies to abandon their present equipment, which can not be expected ; and if it were practicable, it is doubtful whether favorable results would follow from such a change.

The constant running of long and heavily loaded freight-trains, moved, oftentimes, with two thirty-five ton locomotives coupled together, over our iron bridges and steel rails with safety, while the thirty to thirty-five ton drawing-room and sleeping-cars are in daily use in trains of from six to ten cars, proves that the superstructure will warrant the use of freight-cars that weigh twenty-five tons each when loaded.

I would suggest the advantage of increasing the length of freight-cars to thirty-four or thirty-five feet, to carry fifteen tons ; this would reduce the dead weight very largely, and place the weight to be moved in trains nearer the power used to move it, requiring less side-track and platform space. If we take the average freight-train of thirty-five twenty-eight feet cars, at the usual weight of nine tons per car, and allow ten tons freight for each car, we have a train weighing 665 tons ; 350 tons paying weight to 315 tons unpaying weight, not including the locomotive. Now, if we take twenty-six cars, built to carry fifteen tons each, weighing, say, ten tons per car, it would make a train weighing 650 tons, a decrease of fifteen tons in the train, with an increase of forty tons in paying weight and a decrease of fifty-five tons in dead weight, with other advantages already named.

The subjects upon which committees are to report should be fully and freely discussed by all the members present. It is only by the freely expressed views of the think-for-myself mechanic, that we can arrive at the object of our Association.

Many of the reports reflect credit on the committees, and honor upon the Association.

I would ask you to assist our committees by answering fully and promptly their circulars sent you from time to time. If you have the information at hand (which I trust you all have), it will require but little time to fill up the blanks.

I would suggest that the committee to present subjects for discussion at our next Annual Meeting, be appointed early in this session, in order that the committees to whom those questions shall be referred may be fully decided upon before we adjourn.

Gentlemen, I thank you for your kind attention to these imperfect remarks, and ask your indulgence and support in the further discharge of my duties.

VICE-PRESIDENT PRO TEM.

MR. H. O. WADLIE, the Vice-President of the Association, being absent, Mr. M. P. Ford, of the Pitts-

burg, Cincinnati and St. Louis R. R., was chosen Vice-President, pro tem.

HEATING, LIGHTING, AND VENTILATION OF PASSENGER-CARS.

MR. W. E. CHAMBERLAIN, Boston and Albany, presented the following

REPORT.

To the Master Car-Builders' Association :

GENTLEMEN : We have seen in some of the journals of the trade a request for short reports. Keeping this thought in view, we trust that we shall be indulged in a somewhat tardy progress, owing to the difficulties in our way; since, in treating the subjects which have been assigned to us, we are compelled to travel paths but little frequented, where there are few familiar landmarks, it becomes us to proceed cautiously and with painstaking care.

When the very alphabet of a subject is unfamiliar to most of us, there is the strongest temptation to treat it empirically or to dispose of it summarily. In their last year's report, your Committee attempted to grapple with the question, as to what constituted good ventilation, and referred to a number of the highest known authorities in that branch of science to which this subject relates, such as Huxley, Carpenter, Donkin, Du Chaumont, Pettenkofer, and R. Angus Smith. These were found to agree substantially among themselves, as to the amount of air required, and they were quoted at some length to enable members who had not given the subject much study to form opinions based on a wider experience than their own. This year, in addition to the usual circulars to car-builders, asking for information, a special circular was prepared and sent to about one hundred scientific and professional gentlemen outside of this organization. The whole number of replies received so far is fourteen, being about equally divided between the car-builders and the professionals. These replies are valuable in many instances for the information which they contain, and in all instances as showing the state of the art, and their authors have our most hearty thanks. To those who have not favored us with any reply, either through want of knowledge on the points raised, or for any other reason, we can not do less than recommend them to a study of the authorities cited, and to a careful attention to our reports. We are aware that the subject, in many of its details, admits of a great diversity of opinion, and we would not wish in any way to limit a free range of discussion.

[The great length of the report compels us to omit here a considerable portion of it.]

We come now to a consideration of some of the devices that are proposed for heating and ventilating cars. We can not, of course, in the time allotted us, cover this branch of the subject very fully, but we consider that all those inventors who have taken the trouble to present their plans for our consideration, are justly entitled to a fair presentation of the same, subject of course to criticism so far as we may consider criticism necessary or pertinent.

We have heretofore referred disparagingly to all that class of ventilators which are placed in the sides of the dome, and provide exhaust-vents simply. The reason is that these are notoriously ineffective, when the work to be done is appreciated and taken into consideration. With these vents all open, we have seen a car filled with smoke, and carrying the same till the smoke had become fairly dissolved with the air, and thus invisible, rather than go out at the vents.

We are sorry to say that, on a very large proportion of the cars in use in this country, this is the only kind of ventilator provided.

In regard to another class of ventilators which provide for sweeping the car with fresh air as the car moves, either through end-openings or by means of a fan, all of which plans have more or less merit, descriptions have already been given, and we have nothing new to communicate. It may be said, however, that the question whether a fan may be practically run for any length of time by a belt under a car, appears to have been successfully demonstrated by a car in use on the Boston and Albany Railroad.

Of the more recent devices to which our attention has been called, we may mention the following : Mr. A. W. Gates, of 28 State street, Boston, is the inventor of a device for distributing the air which is admitted at the end of a car under the hood. It consists in lowering the head-lining of a car a few inches, so as to allow an air-passage through between it and the roof, and communicating with the interior by means of a wire-cloth, or perforations through the head-lining, the entire length of a car. An adjustable swing-sash regulates the outward openings to this air-passage at each end of the car.

Mr. L. S. Starrett, of Athol, Mass., is the inventor of a car-window which, instead of opening upward in the usual way, opens outward from either side, and is designed to act as a deflector of dust and cinders coming from the direction in which the car is moving. Mr. H. A. Gouge, of 229 Broadway, New-York, who is understood to have had considerable experience in ventilation, has sent us a model and drawings of his plan for ventilating cars, which may be described as follows : A heater, with a sort of interior oven, stands in each end of the car. From this oven extends a pipe with a slit or opening the entire length of the car near the floor, and also a double pipe, terminating in hoods to catch the air, extends upward through the roof.

The air taken by the hoods is driven downward to the oven, and thence through the distributing tube and the slit opening into the car. Provision is also made for collecting the dust and cinders that enter with the air, which are to be occasionally removed from the car through the bottom. Exit openings are also provided through the roof.

We have also received elaborate drawings and a description of a ventilator and warmer from Messrs. F. & J. Chalfant, of 2221 Bainbridge Street, Philadelphia. The description is as follows : "The air is taken from the front of the locomotive ; the blower and small engine sits directly back of the smoke-stack, and forces the air, whether the car is in motion or not, back over the tops of the cars, and is taken into cars by pipes, and distributed by means of a register in each window, to be used by each passenger at will. It is air-tight and silver-plated, and by a screw-valve can be let on as little or as much air as desired, and can be turned to let the air pass against the window at any angle desired, from the top to the bottom, down into the seat, across the seat, just as desired. There is a stop in the end of the register to prevent it from being turned so the air will pass in the face. The pipes on the top of the car are uncoupled in an instant, and coupled about as quick as those of the air-brake. The air is turned in cold weather through the heater under the car, and is brought up warm through the registers that are now in use on some roads. Those registers may also be used for cold air in summer. We also have cold air in the register at the window to save raising it in unpleasant weather."

It will be observed that one excellence claimed for this device is that it provides ventilation when the cars are standing still. But it happens usually that when the cars are standing still the engine is also disconnected, and the means of supplying air thus cut off. But apart from this consideration, it is but fair to say that the elaborate mechanism required for making this scheme successful, would not seem to commend it to railroad men accustomed to the shifting and mixing of cars. If any such plan should ever be adopted, it would probably be when all similar plans had utterly failed. Several others have shown devices which your Committee have not regarded of sufficient merit to warrant them in taking the time of the Convention for a description. One of these had an erratic kind of bellows which was expected to inflate a car most beautifully. Another sought to conduct air through tubes standing in the centre of the aisle between the seats. Another still had a sort of deflecting air-trap which he proposed to insert in the door of the car.

In this connection we desire to say that the discussion of the question of ventilating cars while standing still, seems to us to have heretofore received an undue amount of attention. It may be reasonably doubted if any possible or practicable means of ordinary ventilation would be adequate, in hot weather, to ventilate a car-full of passengers, while the cars are standing still, without being supplemented by a resort to open windows and doors. When the car is standing still, the conditions of ventilation are all changed, and it would not seem wise that the subject should be encumbered or complicated with difficulties more than is absolutely necessary

As to which part of the car ordinarily contains the worst air, it is found that there is very little difference. By the laws of diffusion the gases disseminate themselves very rapidly, but in practice the air in the top of a car is said to contain a trifle more carbonic acid than that taken lower down. Accordingly it makes little difference, so far as the purification of the car is concerned, whether the air is taken in at the top and let out at the bottom, or taken in at the bottom and let out at the top, or taken in at one end of the car and let out at the other. The main consideration is how to get the requisite quantity of air into and through a car without creating a draft ; and the true plan would seem to be to get the fresh air mixed as much as possible before it comes in contact with the passengers.

That the fresh air should be properly heated, either before it enters the car or before it reaches the passengers, is a prime requisite without which any plan of ventilation will prove a failure.

In conclusion, your Committee recapitulate some of the results of their investigation as follows :

First. The demand for good ventilation in cars is founded on a necessity which the growing intelligence of the traveling public can not fail to appreciate.

Secondly. A satisfactory hygienic condition can not be maintained within a car with a less delivery of fresh air than 1000 cubic feet per minute for each sixty passengers.

Thirdly. It is absolutely necessary that the incoming air should be freed from dust and cinders, and in cold weather raised to an agreeable temperature before coming into contact with passengers.

Fourthly. Any plans or devices which substantially accomplish these results, and are not too expensive or so complicated as to require much care, are worthy the attention of car-builders. In regard to lighting cars, your Committee have nothing new to report, and would refer you to the two previous reports.

W. E. CHAMBERLAIN,
V. D. PERRY,
A. GLEASON. } *Committee.*

The discussion of the report being in order,

MR. W. E. PARTRIDGE said : I would like to say a word about the quantity of air which the report mentions as being required for passengers. I suppose many of you would consider 1000 cubic feet per minute coming into the car as something pretty large, just as I did, until I was led to investigate somewhat as to the actual quantity required, and as to the size of the opening necessary to admit sufficient air for a car-load of passengers. I found that 1000 cubic feet is not so large a quantity as we are apt to imagine. A small opening, with the air rushing through it at the ordinary speed of a car, will supply a thousand cubic feet per minute, and a great deal more. For example : I saw a car which was so full of tobacco-smoke that you could hardly see across it, freed entirely from the smoke, and the air purified in less than two minutes, and while the car was standing still. The ventilators were opened while the car was warm, and the air rushed in at the door. The openings were comparatively small.

MR. W. E. CHAMBERLAIN, Boston and Albany.—I have two plans of ventilation here (exhibiting a drawing). One is a plan of Mr. H. A. Gouge, of this city, and I would invite that gentleman, who is now present, to explain his plan before the discussion proceeds, so that members can take him on all sides, if necessary.

THE PRESIDENT.—If there is no objection, Mr. Gouge will explain his mode of ventilation.

MR. H. A. GOUGE.—The drawing represents an apparatus designed simply for changing the air in a car. Ventilation means, of course, getting the air in from the outside, heating it in winter, passing it through the car, and then letting it out. This is what I understand by ventilation. This apparatus has been tried on an old car on the New-Haven road. A large aperture is under the hood in front. As the cars are in motion, a current of air is injected down a tube, and discharged at the bottom. It is heated, and then passes down through the tube, and goes through the length of the car. The other comes in through this end of the car, and is deflected down toward the bottom. No current is produced. As much as 1200 cubic feet of air can be passed through the car per minute, without producing any current. On the other end is shown the same apparatus, but without the heating arrangement. The air is discharged at the floor, but it is exhausted at the ceiling. There are two outlets and one inlet. The heating apparatus is intended to take the place of the ordinary arrangement upon cars for this purpose. It is on the same principle as a furnace. It is a hot-air arrangement. The drafts are of course under perfect control, and also the fire, in order to secure an even temperature. The trial of this plan was in a car, when the thermometer stood at 10° above zero, and we could heat the car as high as 90°, which is certainly hot enough. There are also side-injectors, so that the air can be introduced at the sides as well as at the front and rear.

MR. M. P. FORD, Pittsburg, Cincinnati, and St. Louis.—How does this system differ from the Spear car-warmer and ventilator ?

MR. GOUGE.—I do not know, as I am not fully acquainted with that system.

MR. FORD.—It is pretty generally understood, I think, by the members of the Association. The air is taken from the top of the car, through the hood, and carried down and around the stove, and discharged through a passage into the car.

MR. GOUGE.—In my plan, the larger quantity of air is taken up from under the feet, and the smaller quantity from the top.

MR. FORD.—Spear takes it all from the top.

MR. GOUGE.—Then his plan differs from mine. A large quantity is taken from under the hoods, and conducted down. In this case it rises again to the top. Is that his plan ?

MR. FORD.—It only goes around the stove.

MR. GOUGE.—Then the air comes down in this way (referring to the drawing), and is conducted through this tube. This drives the air in here with great velocity. It will be sifted of all dust and cinders. It

has to rise up to the top again, before any can get out. The cinders are deposited at the bottom of the stove, and do not pass into the car at all. The outlet is the nicest point of the whole thing. I have a model by which I could show you how this outlet is constructed, so it will not admit either dust, cinders, or rain. The outlet has been tried of different sizes. It is a regulated valve, which opens by lifting a weight. You can admit the air at the front end, and discharge it at the opposite end. There is no machinery; the action is all automatic. When the car is stationary, the pressure of the heat is sufficient. The large apertures will take the heat up and ventilate the car. When it is warm, the doors are generally open. This experiment was tried to ascertain how many cubic feet of air per minute could be made to pass through the car without producing a current. Actual measurements were made. I only put in two openings to try it. I could get 500 feet per minute with a certain size of tube; and by increasing it, of course I could get more. I used a diamond-shaped pipe, 11 inches around. The train moved at ordinary speed. On an express train, we get about 300 feet per minute; running at 25 miles per hour, we could get about 250 feet per minute. When we went faster we could get more. It was tested five times—once on an express train and four times on an accommodation train. There were only two openings, which admitted 250 feet through each; all the other openings were sealed up. By increasing the size of the openings, 2000 feet of air per minute may be admitted, without producing any current through the car. The hoods are of various sizes, and in the form of a funnel, contracted down so as to get a pressure down the tubes. It is on the principle of getting an induced current through an opening.

The expense of putting up the entire apparatus would be $400 or $500 per car, depending somewhat upon the finishing. It can be used in summer without a stove, by using the same pipes. The foot-warmer, I omitted to say, passes through the car on both sides, and the air is distributed equally on the sides. The pipes run in a straight line along the wash-board, and are protected by a double thickness of felt.

A MEMBER.—Would those pipes answer the same purpose as the Baker heater in the drawing-room cars?

MR. GOUGE.—They would take no more room for the heater. I tried this arrangement in various ways. One way was to have the air pass out of the apertures of this long tube, and deflect the air in at the bottom. This tube was 11 inches high and 4 inches wide. That came up almost under the seat. Then I tried the diffusion of the air, by having it all admitted at the front end in cold weather, and then notice the difference in temperature above at the two ends. I found that the air diffused itself very rapidly, and so far as ventilation is concerned, you can admit the air at one end and exhaust it at both ends. The air diffuses itself so rapidly, that it is only necessary to admit it. The air is exhausted at the top of the car altogether. Only one furnace is used to a car, and takes up about 41 inches.

A MEMBER.—I suppose your hoods are reversed.

MR. GOUGE.—Yes; that is, divided; one works one way, and the other the opposite way. They are both entirely distinct. I tried it in various ways. I tried it by running tubes to the bottom to get an induced current there, and then I tried to discharge it at this upper opening.

MR. F. D. ADAMS, Boston and Albany.—We have all understood, and have been so informed by scientific men, that carbonic acid is very much heavier than ordinary air, and therefore falls to the floor. This being a very objectionable element of the atmosphere, we want to get rid of it. Is there not a difficulty in forcing this out at the top, being as it is heavier than the other air? Will it under this arrangement be forced out at the top?

MR. W. E. CHAMBERLAIN.—You will find, according to scientific authorities, that there has been considerable misapprehension in regard to the properties of carbonic acid gas. They claim, as you will see in our report, that it does not make any difference in regard to that point—that as much carbonic acid goes out at the roof of the car as at the bottom.

MR. GOUGE.—You have broached a question now in regard to which I have my doubts. I have, for the last fifteen years, devoted a great deal of time to the ventilation of buildings, and expended several thousand dollars in analyzing air with a view to ascertain its composition and properties. I have experimented in school-rooms and various other places, including the Senate Chamber and Hall of Representatives at Washington. I was before a committee of Congress, three years ago, who published a report of 280 pages in regard to the ventilation of the Capitol, and to ascertain where air should be admitted and where drafts should be made from. The committee were divided on the subject. Some of the members thought the air should be introduced from the floor, and some from the ceiling. We made a test, and found 100 per cent more carbonic acid at the ceiling than we did at the floor, and 50 per cent more in the gallery than at the floor. This has been my experience in a dozen or more analyses. I have been in the grottoes at Naples, where we can see it come in at the door of the cave. If you put a dog in the cave, he turns on his back, overcome by its effects; but if a man goes in, he can live just as well in the cave as out of it. Carbonic acid gas is generated there in large quantities, so much that it does not have a chance to diffuse itself, but accumulates and fills up the cave. You can even take it in your hat and carry it across the room and pour it into another hat; but if you leave it there a little while it will diffuse itself. This diffusion is a wonderful thing; nobody can explain it. We find it in old wells and caverns in great abundance, but it is not always on the floor. In breweries, for instance, where there are enormous quantities generated, you find it just as much at the ceiling of a room as at the floor. If the theory of carbonic acid settling upon the surface were true, it would be impossible to live on the face of the earth. I know there is a popular impression to the contrary, but it is not confirmed by tests.

MR. W. R. DAVENPORT, Erie Car Works.—In your arrangement, I should think that when the train was running, if the heater was in the rear of the car, the front part would be too cold for comfort.

MR. GOUGE.—It did not prove so in the case referred to on the New-Haven road. We went from here to Stamford on a way train, and on our return stopped a dozen times or more. This was in January last, when the weather was extremely cold. Some thought the arrangement would be a very good one, provided we could heat the car, and we did heat it to 92° at the forward end while the heater was at the rear end. There was only about 3° difference in the two ends.

MR. JOHN KIRBY, Lake Shore and Michigan Southern.—When doctors disagree, who shall decide? We have heard statements in the report of our committee, which are quite in conflict with those made by Mr. Gouge. I think it is stated by the committee that it is as impossible to draw the bad air out of the car at the roof as it is to draw the fire-damp out of a well or a coal-mine. This gentleman, however, proposes to draw it out at the roof.

MR. CHAMBERLAIN.—I think the report says that it can not be done without some assistance—without some opening through which it is forced.

MR. KIRBY.—That force is employed in a great many cases where they claim to let the bad air out at the roof. There has been so much said on the subject of ventilation, that I am disposed to leave the matter with those who are better posted in regard to it than I am. There seems to be a great difference of opinion, and I don't know how the matter can be settled unless each individual decides for himself. I do not suppose that this committee can recommend any thing that will be agreed to by all the members of the Association.

MR. M. N. FORNEY.—I have been told that if I did not stop talking on this subject, I would be called Ventilator Forney, and as I do not want that name, I had resolved to keep quiet now, especially because I think that this question is in a fair way of being solved. It has been surrounded with more difficulty than there is any necessity for. My impression is that in our practice heretofore we have made a very simple mistake. We have undertaken to ventilate cars by drawing the air out without making at the same time any provision for letting it in. We now see that it is necessary, in order to ventilate a car, to admit the air, while heretofore we have only provided for exhausting it. I think it makes very little difference whether the air be admitted or exhausted at the top or bottom, but you must be quite sure that it is both admitted and exhausted. Nothing short of this will suffice. A practical difficulty has been referred to—that of warming the air sufficiently for comfort. I think we have noticed that all sorts of animals, men and women included, have a great dislike of cold, and that there is nothing so deleterious to health as getting thoroughly chilled. This causes passengers, by a natural instinct, to close the apertures by which cold air enters or warm air passes out, for they think that warmth is of far more importance than pure air. We can endure impure air for a while without apparent injury. To ventilate properly, you must admit pure air, and keep it warmed so that passengers will not get chilled. In the first place, there must be some arrangement for warming the air; secondly, you must admit enough of it to provide fresh air; and thirdly, you must exhaust enough of it to keep the air pure. If you do these three things, I do not care by what contrivance, you will be sure to have sufficient ventilation for all practical purposes. The specific plans for doing this I would prefer to leave to the ingenuity of car-builders. They should comprehend the necessity of introducing a sufficient quantity of fresh air, and not suppose that ventilation is secured by merely exhausting the air. Some years ago, when I was connected with the Illinois Central Railroad, a system was applied there which was very effective, and I would ask Mr. Snow, who is present and represents that road, whether he is still using that system, and whether it is successful.

MR. W. B. SNOW, Illinois Central.—We are still using the same appliance, introducing the air through a revolving hood. We first used a stationary hood, but could not get enough air through. Sometimes we worked an exhaust, instead of taking in air. Then we put on the revolving hood and run the air through a common Howard stove, down to the bottom and around the stove, and then to the top of the stove down into the flue that leads along the length of the car. We do not have any trouble at all. We can keep a car just as warm as we wish. We close a damper to prevent the car getting too warm. We also had a plan of ventilation that worked very well, and consisting of four openings about 16x22 inches on top of the car and at each corner, which took the air in at a height of about five feet from the floor through a register that we could close. We then tried to exhaust the air at the bottom, but the arrangement was not very satisfactory. We had an air-space under the seat which ran along to the end, where there was a large exhausting hood on top. This worked very well as long as we took care of it and kept it from getting filled up with cinders. At one time we had an iron water-tank in connection with the arrangement, but do not use it now. We found they were not kept filled with water. As long as they were kept filled they worked very well.

MR. CHAMBERLAIN.—Is not this principle of heating precisely the same as Spear's plan, with the exception of the revolving hood?

MR. SNOW.—I should think it was just the same as that which has been shown here, if I understand it correctly, except that you have registers at every seat and a way to let out the hot air. We used two stoves at diagonal corners.

MR. FORNEY.—The system is exactly like Spear's, except that the hood is made revolving. I understand that there is sometimes a difficulty in Spear's plan because the hood is fixed; that when there is a strong wind, or a wind in the rear, the draft is liable to be reversed; but with this revolving hood, you are always sure of having a current, no matter which way the train is running. It seems to me the revolving hood is an important thing in any system of ventilation. It should be made in a very substantial way so as to stand wear and tear. There is a specimen hood down at the car-builders' rooms, in Liberty street, that I approve. I do not know who presented it, nor do I wish to be understood as blowing for this particular hood. It is made of cast-iron and has a turned joint, and will stand, I should think, almost any amount of wear and tear on top of a car. I would ask Mr. Chamberlain what success he has had with ventilators in the front end of cars. I remember he introduced them a few years ago, and put a notice on them that if passengers wanted fresh air they must leave that ventilator open. Has that notice had any practical effect upon the passengers?

MR. CHAMBERLAIN.—We have had some little difficulty with that system. If we did not open the ventilators, or if they opened a little hard, the passengers would take an umbrella or cane and open them for us by punching a hole through the glass. The only complaint that has been made in regard to this plan is that sometimes the current of air comes too strong on the passengers. Probably by the time the next convention meets, that system can be remedied so that the air can be diffused more evenly through the car; and in regard to the general subject of ventilation, another year will probably develop something a little more practical than any thing we have seen yet. The ventilator explained to you by Mr. Gouge, and that made by Mr. Gates, of Boston, seem to be the only ones in use that are entirely practical. I think that it is possible for the car-masters of this country to take hold and devise a perfect plan of ventilation for cars without the use of patents. I am not positive, however, that it can be done. I find that the more I dabble with the subject the easier it is to ventilate a car, but you want to keep away from scientific gentlemen. I have learned this from the replies received by the committee to some two hundred circulars sent out to these gentlemen.

THE PRESIDENT.—I have been requested by several prominent railroad men to ask the members of this Convention to present some plan by which freight-cars carrying perishable freight can be ventilated.

MR. D. A. HOPKINS, Erie R. R.—Mr. Chamberlain has suggested that he hopes to ventilate cars without the use of patents. There is one very serious difficulty in the way of doing that, which is that just as soon as any car-master or any body else gets up something that is thoroughly good, he applies forthwith for a patent, and in so doing I think he acts sensibly.

MR. CHAMBERLAIN.—If car-masters have done it, past experience has shown that nineteen out of every twenty have thrown away their money, for there is not yet a perfectly ventilated car in the country.

MR. KIRBY.—This matter of the ventilation of freight-cars I have given some attention. I suppose the inquiry has reference to all kinds of freight. I think it has been demonstrated that a car used for carrying meat or other freight of that description, does not require any ventilation. The admission of air from the outside into a car of that kind is, I think, a mistake. Some of you doubtless are acquainted with Fisher's plan of a refrigerator car, into which no outside air is admitted. You can put bread or meat into it and keep it there a week, and it will come out dry. The ventilation is carried on within itself. The warm air is supposed to rise, passes over the ice, cools itself and descends, and by that process the ventilation is going on all the time. We have cars that were fitted up last summer for carrying this kind of freight. They were fitted up temporarily, however, and our general freight agent persisted in having holes made in the car, two at each end, and tubes were put in to draw the cold air into the car. It has been found that you can not carry ice in such a car for any length of time; that you must renew the ice three times as fast as you would have to do if the air was kept out. It is just the same with the refrigerators. If you admit the air from the outside, the ice will dissolve in a very short time. I know of parties in Adrian, where I live, who have tried different kinds of refrigerators. Some of them let in the air from the outside, and the consequence is the ice must be renewed every day. On the other hand, ice will keep in the Fisher refrigerator system for three days. This seems to settle the question of admitting the air from the outside. I speak from observation and from some experience.

THE PRESIDENT.—You misunderstood the request a little. It did not refer to the ventilation of cars having ice-boxes as refrigerators, but to cars that do not carry ice—cars carrying fruit and other perishable freight, but no ice.

MR. CHAMBERLAIN.—I think the question has not been misunderstood. If you have ever taken notice in your houses, you will find that strawberries, for instance, which are put into the refrigerator or in the cellar fresh in the morning and taken out at night, will have changed from their natural red color to a dark purple, and it is just the same in transporting perishable freight in a car. As Mr. Kirby says, if you undertake to ventilate a freight-car containing perishable freight, your ice will melt three times as fast if you have an opening for the air to come in from the outside, as it will if there is no opening. I know from my own experience that such is the case.

THE PRESIDENT insisted that the request had reference to cars that did not carry ice.

MR. F. D. ADAMS.—I think the two gentlemen last up are correct in their views. If it is proved that berries, or freight of any description, can be carried better with ice than without it, it would be folly to recommend any system of changing the air continually if it caused the fruit to perish. It is no doubt a fact that if the air is kept sufficiently cold and unchanged, the fruit will remain unchanged during its transit. It seems to me that is just what is wanted, a car made perfectly air-tight and kept cold. There should be no holes in it at all.

MR. W. T. HILDRUP, Harrisburg Car-Works.—It strikes me that this question is one of temperature alone, and that if you have a low temperature in your car the fruit will decompose very slowly, while if you have a high temperature it will decompose rapidly. If the outside temperature is colder than it is in the car, then ventilation is desirable. Closed cars sometimes become very much heated. They become heated during the day and maintain that heat during the night, whereas if ventilated, they would become cool during the night, and consequently decompose the fruit less rapidly. I draw my inferences, not from a railroad-car, but from some experiments which I made at my home. I put up a building specially for the preservation of fruit. It was on the principle of an ice-house, with twelve inches space between the walls, the space being filled with saw-dust. It had double windows for the purpose of maintaining the temperature as even as possible. In extreme cold weather, I very seldom have to introduce artificial heat, the temperature remaining quite uniform day and night. The object is to maintain as cool and as low a temperature, without freezing, as possible. I have been able to keep fruit until May, as fresh as when picked from the trees. From my experiments and observations in this line, I draw the inference that carrying fruit on a car is simply a question of temperature. The whole matter depends on very simple principles. I often think that the daily lessons of our lives convey to us often more than all the books we can have access to. The presence of ice in fruit-cars secures a low temperature; the introduction of air from the outside over the ice, melts it, and consequently it must be more frequently renewed; and further, the admission of warmer air destroys the very object sought by introducing the air. There are no offensive gases or odors arising from what we want to carry in the ice-cars.

MR. HOPKINS.—I think it is a clearly established fact that in portions of Mexico, and in some of our Western territories, fruit and even fresh meat is kept for a long time in a very warm atmosphere. Meat is kept in this way until it dries up. The temperature is not exactly hot, perhaps, but it is about our summer heat. The most of us have seen strawberries and other small fruits that have been preserved effectually in dry summer weather in the fields; so that I think the temperature is not the only consideration that enters into this question.

MR. W. W. WILCOX, Chicago, Burlington, and Quincy.—I would state to the Convention that a gentleman is present—Mr. James Montgomery, of New-York—who has had much experience in regard to ventilation, probably as much as any man living. He can, doubtless, in a few minutes' time, give us a good deal of information.

THE PRESIDENT.—If there is no objection, we shall be glad to hear from Mr. Montgomery on the question now pending.

MR. MONTGOMERY.—I have given a good deal of attention to the ventilation of ships and cars, and also with respect to its influence upon health. Poor ventilation is a fruitful cause of consumption. It is only from the stand-point of an organic chemist that it is possible to understand this matter. It is absolutely necessary to change the air in the car unless ice is present. Moisture is necessary with heat to produce decomposition. Meat can be carried merely by exposure to the air, provided that air is dry. On the pampas of South-America and in New-Mexico, meat is thus preserved. If we have a car thoroughly ventilated, and in which the air is frequently changed, the fruits carried with the car emit moisture, and the moisture swiftly produces decomposition. If we were to place certain acids in the car to absorb the moisture, and then seal up the car hermetically, we might dispense with the ice, but not otherwise. In the absence of these acids, you must have absolutely a free circulation of air. The very conditions that induce a rapid decomposition of fruits are the very conditions that produce consumption in the human system, and in every animal that has to arterialize its blood. The same law runs through all nature. The man who understands this thing as a chemist, and who is ingenious in mechanical devices, can meet this subject, and he can not do it otherwise. Temperature has something to do with the production of the carbonic acid gas; I can not name the exact quantity that is present in the atmosphere. The carbonic acid gas, following the law of gravitation, it being heavier than the atmosphere, will, in the nature of things, sink to the bottom, and will pile up in the car just as water will in a tank. Hence, it is absolutely necessary to have some means of ventilating from the bottom. These gentlemen can readily arrange a car to meet that difficulty; and in so doing the heat will be economized. In passenger-cars, even in winter, we must provide some means to get rid of the immense volumes of carbonic acid gas which are expelled from the lungs. It is present in the car after it has been occupied for a short time, in a volume which would astonish people if they were to take the trouble to investigate the matter. If you would investigate it, you would understand why we have so much consumption, and would wonder why we do not have more. As it is, consumption kills one half of the race in these Northern States, and the only wonder is that it does not kill them all. Therefore, in discussing this subject, we are discussing what relates to the preservation of our lives. It is safe to assume, when people travel so much in the cars as in this country, that at least twenty per cent of the consumption of the country is due to the want of more perfect ventilation. It is a difficulty that can be fully comprehended and in a measure provided for, and I think, at a very trifling expense. I have no plans to offer; I only wish to state these simple truths. You want dry air, and air that will be deprived of carbonic acid as rapidly as possible. These are the conditions necessary to perfect preservation of fruit as well as of health.

MR. M. C. ANDREWS.—It seems to me that the question before the Association needs a little more attention, and it seems to me we might come at it in a way like this: that whatever plan of ventilation we adopt for passenger-cars may well be adopted for freight-cars. It has been remarked that their temperature is the essential thing, and we accomplish our object when we succeed in regulating the temperature. If the air which has been kept in the car during the day is not changed, it will continue there during the night. If we can place one car inside of another, as it were, with an air-space between the two, and the air is changed in that space while the air in the inner car remains without being changed, the inner car can be kept very much cooler than would be possible if the air was changed during the day or night. It seems to me, therefore, that if we could adopt some way of building a car and leaving an air-chamber between the two walls, so that we could change the air frequently, we could keep the air of the car very much cooler, and therefore would accomplish the object asked for by the question which has been put.

MR. AMBROSE WARD, Penn. R. R.—I would like to ask the question whether the arrangement of running a ridge on the top of the car would not carry off the gas and the heat while the car is standing still. When the car is running, the current of air caused will ventilate quite sufficiently; but when the car is standing still it gets very hot, and any thing like fruit, or fish, or meat, will decay very rapidly. Will not an opening along the roof allow the air to escape? The ridge could be used as a foot-board and as a ventilator at the same time. There being an opening along the ridge or roof, the heat would rise, the air would enter at one side and go out on the other; and there being an opening and a screen, for instance, at each end of the box, it might answer the purpose of ventilation.

MR. MONTGOMERY.—What I meant to explain just now was, that if we were to depend upon the air alone for the preservation of fruit, there should be ample provision made for the free circulation of air throughout the car. If ice is used, there must be enough to refrigerate all the air, because otherwise aqueous matter or vapor will float about in the car and cause the fruit to mildew. The other day, in coming from Charleston, I saw a beautiful apparatus for producing an artificial circulation of air. There was an enormous refrigerator, large enough to hold thousands of baskets of berries and a sufficient quantity of ice. A fan was worked by a small oscillating engine, drawing a strong current of air through the refrigerator, back and forth, through and over the berries, which were as cold as ice. The temperature was 34°, even and uniform. But as such an engine can hardly be afforded for each car, therefore a sufficient quantity of ice must be used, or else a free circulation of the air, and plenty of it from the outside; because air from the outside, even when it is warm, will be dry, and it is dry air that we want to prevent decomposition. It would be well to put in such cars a hygrometer to indicate the moisture, and if the instrument shows over half a degree, means should be taken to introduce additional air so as to keep the air dry.

MR. GOUGE.—The gentleman says that means should be provided to change the air. How would he do that? That is the indefinite part of it. The question is how much or how little is necessary, and what would be the conditions? If a hygrometer is used to determine the amount of moisture, how would you remedy the difficulty when it showed that there was too much or too little moisture in the air.

MR. MONTGOMERY.—That is very easily done. You must arrange an exhausting and forcing machine, the one to force the air in and the other to exhaust it, each having regular valves so that you can regulate the amount to be admitted. It could be made automatic. You could thus readily determine how much or how little needed to be admitted. The volume could be regulated by a very simple apparatus by which you could introduce the amount necessary, either for the preservation of fruit or meat, or for the healthful action of human lungs. The motive power would be the moving train, which will act by exhaustion to get the air out and also to force it in.

MR. GOUGE.—That is very definite. Suppose you make an ice-box, ten feet each way; how much air would be necessary to pass through each car or enclosure in order to keep it free from gas and keep the air perfectly pure inside?

MR. MONTGOMERY.—That would depend upon the quantity or volume of fruit and air therein contained. If all the available space were filled, it would then depend upon whether it was a fruit or passenger-car.

MR. GOUGE.—You do not understand me. No matter how the thing is located; if you could manage to pump in fresh air from the outside, and exhaust it from the inclosure, how much would be necessary to keep a ton of meat in that place?

MR. MONTGOMERY.—It would require a column of air about a foot square, in circulation, and moving at the rate of ten feet a minute. That would be ample.

MR. GOUGE.—I should think it would. I would not want to pay for the ice to be used in such a car in this locality.

MR. MONTGOMERY.—I am not talking about ice now. I propose to keep the meat without any ice whatever, simply by the circulation of air.

MR. GOUGE.—That is an easy matter to do; but now we are talking about a more expensive machine where ice is used—about doing it in a chemical way by removing the gases.

MR. MONTGOMERY.—A very simple instrument could be arranged to hold the temperature at whatever point was desired. It is a very cheap and practical thing. By such an arrangement, I can take meat around the world in a car or in a ship. This is a subject that I am very intimate with, and there are

many practical people who know me, and who will believe what I say because I say it. The ice can be used with great economy. Not a pound of superfluous ice need be used in the whole twenty-four hours in a car, with the aid of the proper apparatus. I have never gone into this thing as a business, but only as a scientist. I have arranged ships so that the ventilation was perfect. The same conditions can be obtained in a car as in a ship. There is no difficulty about that. It is a simple matter to those who understand it.

A MEMBER.—I move that the discussion close, and the committee be continued another year.

MR. CHAMBERLAIN.—I do not want to serve on the committee another year.

MR. FORD.—I hope the committee will not decline serving again. I believe the Convention appreciates the services that have been rendered. The committee appear to be agreed upon one thing, and that is, that better ventilation is needed in our cars; and, further than that, Mr. Chamberlain informs us that he believes in another year some practical tests will be made calculated to throw more light on the subject. I take that as an indication that he has some such tests in view, and I hope he will aid in bringing the information to us. I believe we are getting our eyes open on this subject. We have found out that in order to secure a perfect ventilation, all that we need is to have the air admitted to the car properly, and also a way of exhausting it. We have heard some very good suggestions, and I am sorry the discussion is to be closed at this time, for I believe there are many members of the Association who have not spoken upon the subject, and who could give us valuable hints in connection with it. I hope the committee will serve another year.

MR. S. GRIFFITH, Indianapolis, Cincinnati, and Lafayette.—I think that the committee deserve our thanks for their very able report. They are better capable now of carrying it on than a new committee would be of taking hold of it, and I hope that they will not refuse to serve.

MR. CHAMBERLAIN.—If the committee have as many difficulties to contend with next year as they had last, I am afraid you will not get any ventilation in their report at all, unless it is made up exclusively from the committee. Something like 500 circulars went out to master car-builders and professional men in the United States, and I believe that we received only fourteen replies. There is no satisfaction in that result. I know that there is not a master car-builder in this country who could not make experiments, or call on some scientific man to give him the exact figures, and show him just what is required, scientifically. We can all help, by the way of experiment, to get at the most perfect system of ventilation. Our efforts may be crude, and the results not entirely satisfactory, but if we each try, and give the Convention the benefit of our experience and trial, we may obtain something which will be really valuable. If we would each do this, and each tell the Convention what he has done, we could get up a report next year which could be relied upon, and secure a means of ventilation which could be adopted on all the passenger-cars in the United States.

MR. MONTGOMERY.—In this matter we must not despise science, for science is the axle on which the world moves. The laws of life are well defined. The air contains a certain percentage of oxygen which is necessary to support life. Now, if we measure into the car a given amount of air, and measure out of the car the refuse air which is found at the bottom, we can then always know, by counting noses in the car, how much each adult person requires to support the arterialization of the blood, and then admit just as much air as is required. The motion of the car, regulating the ingress, regulates also the egress of the air.

MR. HILDRUP.—I have not intended in any thing that I have said to ignore science. I take it that as practical men we are all under the greatest obligations to the discoveries and theories and demonstrations of scientific men. The point that I want to make is this: we are a body of representative or practical men, not scientific. Many of the scientifie deductions rest on simple principles observable in our practical every-day life. Science is not to be ignored but honored, and the men who represent it are to be honored; but there is no occasion for losing sight of the daily lessons, and the simple practical rules of life, because they are most valuable to us. I have not intended in any measure to ignore science or its teachings.

MR. FORD.—The question now is upon continuing this committee for another year. I hope the members will all act upon the suggestion made by Mr. Chamberlain, that each one of us shall take hold of this subject of ventilation in earnest, and see if we can not do something to get up a more definite report in the coming year. I believe that the Association appreciates the efforts that have been put forth on this subject, and I believe that great progress has been made this year. Our time is rapidly passing, and I think that it will not be wise to continue this discussion any longer at present.

The motion to close the discussion, and continue the committee another year, was carried.

The report of the Committee of Arrangements for holding the present meeting was then read and accepted, and the thanks of the Convention were tendered the committee for the satisfactory arrangements made.

SECRETARY'S REPORT.

MR. C. A. SMITH, the Secretary of the Association, reported that during the past year there had been an addition to the membership of twelve new members, and that there are now on the books the names of 197 members, of which number only 61 had paid their annual assessments for 1874 and 1875.

MR. HOLMES.—Do we understand that this is the report for the past year, and that only sixty-one members have paid their assessments?

THE PRESIDENT.—Yes.

MR. HOLMES.—I move that the subject be referred to the Auditing Committee, for a report from them. I think it is important that there should be some provision made whereby the assessments can be collected in full, in order to pay the expenses of the Association, and to make it a success. If the committee report that it is absolutely necessary to make an assessment of a certain amount on each individual member, then it is necessary that each member should take sufficient interest in the matter to pay his assessment. If he can not pay it at the commencement of the year, let him pay it during the year, or at the annual meeting. The assessment last year was large, made so by the committee, to meet what they supposed the expenses of the coming year would be. It seems that but few members have paid the assessment. Where there are but few members who pay the expenses, of course the assessments have to be made larger. If each one would pay his share, then the amount can be kept down.

MR. HILDRUP.—It seems to me that that motion does not meet the case. There may be delinquents who have not paid, for the simple reason that they have not had access to the Secretary or Treasurer. I know that my own assessment was not paid for two years. I requested an officer of the Association to draw on me for the amount, but he failed to do so, and another assessment was made, and two years passed before I met the proper officer to receive the payment, but it was always ready. I merely mention this as an illustration, to show that possibly many are delinquent simply for want of an opportunity to pay the proper officers of the Association. Would it not be better for the Auditing Committee to direct the Secretary to make a draft on each member for the amount due? That would present the matter to them directly, and those who wished to pay could do so promptly, and we will then have positive information as to those who do not wish to pay. I would therefore make a motion that the Auditing Committee instruct the Secretary or Treasurer to make such drafts, notifying the parties a little in advance of the drafts.

MR. HOLMES.—The object of my motion was that the subject be left to the committee, and that they make a full investigation and make their report, and then we can act on that report.

MR. HILDRUP then withdrew his motion, and the motion of Mr. Holmes to refer the subject to the Auditing Committee was agreed to.

ASSOCIATION ROOMS IN NEW-YORK.

The committee in charge of the rooms of the Association, 113 Liberty street, New-York, presented the following statement of receipts and expenditures during the past year:

Receipts to date (June 8th)	$891 64
Disbursements per vouchers appended	870 40
On hand	$21 24

L. GAREY,
H. O. WADLIE,
A. STEINBACH, } *Committee.*

THE PRESIDENT.—It may be necessary for me to say that those rooms are self-supporting. No funds of the Association are used to defray any expenses at the rooms, or for the rooms. What will you do with the report of your committee?

MR. I. W. VAN HOUTEN, Penn. R. R.—Do I understand the President to say that no moneys belonging to this Association are ever expended upon those rooms? Then what business have we with that report? If it is a private matter, why should it come before the Association?

THE PRESIDENT.—It is not a private matter. The rooms were assumed by the Association as their rooms, but on the understanding that they were to be self-supporting. The moneys collected for the rooms are appropriated to no other purpose, and do not pass through the hands of the Treasurer of the Association, but through the hands of a committee, in whose care the rooms are placed.

On motion, the report was accepted.

TREASURER'S REPORT.

MR. AARON STEINBACH, Treasurer of the Association, presented his annual report as follows:

REPORT.

The Master Car-Builders' Association
In account with A. STEINBACH, Treasurer.

CREDIT.

By receipt from assessments to date	$765 85

DEBIT.

To balance due Treasurer last report	107 45	
" postage and stationery	44 75	
" paid G. W. Morris for printing	12 57	
" paid P. Barnes for printing	56 34	
" Photo. Engraving Company	83 40	
" S. W. Green, printing annual report	188 34	
" J. C. Baldwin for printing	69 00	
" W. E. Partridge	121 52	
" A. W. Roover	3 00	
" A. C. Shanks	12 00	
" C. Shinkhorn for reporting	25 00	
		723 37
Balance on hand		$42 48

June 9, 1875. A. STEINBACH, *Treasurer.*

SUNDRY COMMITTEES.

The following committees were appointed by the CHAIR:

On Assessments—Messrs. J. T. Leighton, J. W. Holmes, and S. A. Davis.

On Communications—Messrs. F. D. Adams and John Kirby.

On Subjects for Next Annual Meeting—Messrs. W. E. Chamberlain, M. N. Forney, and W. W. Wilcox.

On Place for Holding Next Annual Meeting—Messrs. B. K. Verbryck, D. C. Richardson, and George Hackett.

On Officers for Ensuing Year—Messrs. J. P. Somerby, W. T. Hildrup, and W. F. Smith.

DICTIONARY OF TERMS.

The Committee on this subject presented the following

REPORT.

To the Master Car-Builders' Association:

GENTLEMEN: Your Committee regret being obliged to report that the Dictionary is still incomplete. During the past year they have held numerous meetings and devoted much time to the preparation of the matter for the work which has been assigned them. They have collected a list of over 1000 terms in common use among car-builders, and most of these have now been defined. Although this list is still incomplete, it is thought that in a few weeks after the adjournment of this meeting it will be ready to put into the printer's hands, and they therefore feel that they can announce that it will be ready for delivery some time during the summer or early in the fall.

Those members who have been fortunate enough not to be on this committee, have little idea of the labor involved in the preparation of any thing approximating to a complete list of terms used in the construction and repair of cars; and the members of your Committee have had repeated and continued cause for regret that they ever undertook the work, and doubtless it would long since have been abandoned, had they felt they were responsible for the amounts of money the expenditure of which is herewith reported.

During the past year, the outlay to the account of the Dictionary has been less than $100, all of which has been derived from a donation received from some friends of the Association.

Owing to the fact that there is no money in the Treasury, if the work had been ready for publication, there were no funds with which the cost of printing could be paid. Just before the meeting of your convention, one of the members of the committee kindly offered to assume the responsibility of the cost of printing, so that as soon as the work is completed, it will be put into the hands of the printer for publication.

The expenses incurred to date are as follows:

Cash to P. Barnes	$56 34
" " Photo. Engraving Co	83 40
" " A. W. Roover	3 00
" " W. E. Partridge	121 52
" " A. C. Schank	12 00
Expended prior to June 11th, 1874	387 15
	$663 41

Your Committee would also report that all the bills that have been made on account of the Dictionary since our last annual meeting amount to less than $100. Your Committee did not feel authorized to contract bills, knowing as we did that there was no money in the hands of the Treasurer. Aside from the donation referred to, no money has been expended for the Dictionary since our last meeting.

L. GAREY,
A. STEINBACH,
F. D. ADAMS,
M. N. FORNEY,
C. A. SMITH,
M. C. ANDREWS,
I. W. VAN HOUTEN, } *Committee.*

RECEIVING AND ANSWERING QUESTIONS.

THE PRESIDENT.—Your committee, appointed last year, to present subjects for discussion at this meeting, have made a new departure. They recommend that half an hour of each session be devoted to receiving and answering questions proposed by any member, the questions to be written on slips of paper, to be collected and handed to the President, and by him put to the Convention. I have several which have been handed to me. The first is:

What is the average expense, at repair-shops, of removing worn-out wheels from a car-axle, boring the wheels, refitting the axle, and pressing the new wheels on?

MR. ADAMS.—I suppose it is to be understood that the car is in the yard, or immediately accessible?

THE PRESIDENT.—I infer that the wheels are at the place where they are usually kept, that they are taken to the press, and then put on in the usual manner.

MR. CHAMBERLAIN.—Are there any journals to be turned up, in case of heated journals?

THE PRESIDENT.—It says refitting the axle. That would include, of course, the journals.

MR. ADAMS.—Then the expense would depend upon circumstances.

MR. KIRBY.—I suppose the question was asked, perhaps, so as to determine about what should be the charge for replacing the wheels belonging to foreign roads. There is a rule adopted by some of the roads to charge $4 per pair for removing a pair of wheels. It is thought by others that that is altogether too much. I should infer from the question that the writer intended just the pressing off of the old wheels and putting the new wheels on the same axle. I should think that it had no reference to turning up the journals. Perhaps the gentleman who presented the question will state clearly what he means in this regard.

THE PRESIDENT.—It calls for the average cost, and I should judge that the party asking the question would include the fitting of the journals if it were necessary. It seems to be simply a question as to the expense of taking off the old wheels and putting the new ones on, taking the old wheels to the shop, removing them, refitting the journals, fitting new wheels, pressing them on, and turning them out of the shop ready for service.

MR. S. A. DAVIS, Boston, Lowell, and Nashua.—I should think that this question was also intended to cover the cost of taking the wheels out from under the car and putting the wheels back again.

THE PRESIDENT.—That is not included.

MR. DAVIS.—If you have a car come into your yard and have to change the wheels on the axle, you have certainly got to take the wheels out and then put them back again.

THE PRESIDENT.—I understand this question to refer simply to the cost of refitting the wheels. The labor of removing the wheels from the car and putting them under again varies greatly, as it has to be done, frequently, hundreds of miles from the shop; and therefore such expense could not be included in the average asked for. This is simply a question as to the expense of removing the old wheels and putting new ones on, and doing whatever refitting the axle may require.

MR. VAN HOUTEN.—Would it not depend upon the time in which it could be done? The difference in the facilities for doing the work would vary the expense of doing it. That would make a great difference in the expense.

MR. CHAMBERLAIN.—I should think that the facilities on some roads were so far inferior to those of other roads that they would have very little of that kind of work to do, because if they had much of it to do, it would be necessary to get first-class facilities.

MR. GEORGE ROWE, N. Y. Cent. and H. River.—Do I understand that the question does not include the labor of taking the wheels out, and then putting them back under the car? As I understand it, the question is as to the expense of refitting the wheel-seat on the old axle, of pressing off the old wheel, refitting the wheel-seat on the old axle, and putting on the new wheel, and also getting the wheels into the shop, ready to go on the axle. I have had some little experience in this regard. We have been called on to note, somewhat, the cost of doing the work; and I would say that it would cost about 75 cts. a pair for fitting such wheels—not taking into consideration the cost of the wear and tear of the machinery used, but simply the cost of the labor.

MR. GRIFFITH.—I believe that the question is, in doing this kind of work, how to make a bill of charges against other roads—how to itemize the charge for whatever you do. I do not see the necessity for getting at the average for all cases. If in the bills you itemize the charges, you will get just what you want.

MR. DAVIS.—I rather think that what the person who asked the question desires to get at, is, the difference in cost over those roads that have extraordinary facilities for doing such work, and those that have no machinery and materials to do the work with. I think if this question is answered on that point, it will have a good effect, as we will then learn the difference in value between improved machinery and old machinery.

MR. LEANDER GAREY.—(Mr. Ford, Vice-President, in the Chair.) This is a question which I asked myself. My object in asking it, was to see whether the master car-builders are keeping any details of the cost of maintaining their departments. At the present time, such details are often called for, and must be furnished. It will not be long before every man will be required to keep a detailed account of every thing he does, and the exact cost of every thing used pertaining to his department; and the sooner we begin to be thus accurate, the better it will be for us. It is a very simple question, but if there are any present who do not keep detailed accounts of the work they do, it will not be very easy to answer it in detail. In calling for the average expense, the question takes into consideration the time it takes to take the wheels from the car, the time required for pressing them on, the cost of refitting and of boring the wheels, the cost of pressing the wheels on and boring them out. I hope if there are any present who have details which will show how this expense is made up, he will present it to the Convention; and this will show the railroad companies, and especially those who have facilities for doing the work, who are behind the age, that they are losing the cost of good machinery every little while in using the old, worn-out, antediluvian machines that are in their shops.

A MEMBER.—I would like to hear Mr. Garey upon that subject, to learn what his own views are.

MR. ROWE.—Time estimated to bore two new wheels, three quarters of an hour; fitting wheel-seat on axle, fifty minutes; pressing old wheels off, twenty-five minutes; pressing on new wheels, thirty minutes. This makes a total of $1.70 altogether. That does not include the expense of labor and machinery; nor is there any thing charged for the use of tools. This includes the service of two men on the press, and one on the axle. This is the actual time spent in doing the work. If there is business enough to keep the men going, they can do that amount of work. I am speaking on the supposition that this work is kept going all the while.

MR. GRIFFITH.—I understand that if you employ four men for half an hour, that is two hours' time; but I would like one further statement on this subject, so that I may be sure that I understand it. I would like to know the total cost, if gentlemen are prepared to give it.

A MEMBER.—We have tried this work at our shops, but we have invariably found that where we ran the mandrel through the wheels but once, we can not make a perfect fit; that necessitates the running of the mandrel through twice. I know that we could not run our mandrel through our wheel-borer, but we have one which does its work on the basis of the time that has been given by Mr. Rowe. Our lathe is not the latest standard; and I know that we can not turn out both the ends of the axle, with one cutter, in the time given by him. We have a first-class press, and we press on and press off the wheels with the same press; and we find that the best that we can do is about $1 per pair, and we can only do it at that rate, when every thing is working its very best; and we could not keep it going more than one day at a time in that way. That is about the best that we can do. The road referred to must have better facilities than we have, and a more perfect boring-machine, in order to do the work in the time specified by Mr. Rowe.

MR. CHAMBERLAIN.—I have had some little experience in this matter, and I think that Mr. Rowe has got pretty close to the figures. We have in our shop some of the most improved lathes that there are in the country. We have on our wheel-borer a man to whom we pay now about $1.60 per day—he did get more, but he has been cut down twenty per cent. He will bore right straight along from 26 to 40 wheels per day of ten hours. It depends a good deal upon the quality of the wheel. We have bored as high as 60 wheels per day, but we did not get quite a perfect job, and we were better satisfied to do a little less. We have one of Sellers' lathes to turn one end of the journal, and when we were turning new axles right straight along, the man running that lathe used to turn out 16 axles per day, or 32 journals $3\frac{1}{4}$x$5\frac{1}{2}$. The fitter, who did nothing else but fit, would fit from forty to 50 axles per day—fitting both ends and entering them into the wheels. The man at the wheel-press would press them on. The cost of unloading the wheels, boring the wheel, turning the journals, turning the axles, fitting the wheels, and pressing them on, is just 65 cents per hour, when axles are turned of that dimension. It has not cost us any more than that during the last three years. We run two cuts through the wheel.

MR. ADAMS.—I want to say a word in relation to this matter, by way of explanation. As I understand the question, Mr. Garey wants to get at the average cost. It is shown very clearly here that it will cost differently on different roads, from the fact that all the roads do not have just the same conditions. Mr. Chamberlain was speaking of the shop of which he has charge, at Boston. I am on the same road, but at Springfield. It costs us more to fit up our wheels than it costs him. We have kept a careful account of it for some time. I find that it costs us about 90 cents a pair, and we can not get it below that. In fact, for a number of years, they were contracted for at $1 per pair. I am speaking now of new wheels. If I understand the question, it is to ascertain what it costs to fit the old ones. Is it any more difficult to fit an old wheel than a new one? In some cases it would be more difficult, and in other cases it would not be near so difficult. A great many of the old wheels, in fact a large proportion of them, there is only one wheel to tire; but you have got the old wheel to pull off in addition to the fitting; but it is not so much work to fit the wheel-seat in the old one as in a new one. You have very little, if any thing, to take off. It is possible that you may bore the hole so as to fit without taking any off. Mr. Kirby spoke in relation to the charges made. His idea is to draw out what would be a proper charge for each road to make for such work. I find that members vary very much in their ideas about it. On many roads where the interchange of cars is frequent and large, the wheels are quite an item of charge, one with another; while on other roads there is no account made of the labor whatever, but simply a charge for the wheels, each road considering that the labor of one offsets the labor of another. On a road that has but little interchange, and where there is only occasionally a broken wheel, they will charge all the items in detail, and they will make up some pretty large bills sometimes in that way, which are not collectible, according to common custom, and we do not always pay them. We calculate to be governed by common custom somewhat, and to do what others do, and we do not want to pay bills that are unusual. We are running our cars over six or eight roads, and we are interchanging all the while, and charging wheels one with another where the labor is not counted in at all, and we simply charge so much per wheel and consider that one offsets the other, and that it is about as fair for one road as for another. I think that the expense will run from 75 cents to $1 on old wheels. But if you are going to figure it down closely, you must take into account the wheels that are broken. Sometimes they are away on the road. They may be twenty or fifty miles from the shop, and in this estimate of cost you must count the expense of getting the wheels to the shop. All the broken wheels do not come into the yard under the car, and therefore you must go out on the road and get them. If it is a foreign car the probabilities are that you have not a wheel that you can put under; and you must send for them. Getting the wheels to the shop costs a great deal more than it does to do the fitting; and I do not think the average of that expense could be got at.

MR. LEIGHTON.—If I understand this question and the motive that Mr. Garey has in asking it, it was not so much to find out what it costs to fit the wheels and axle, but to find out what the master car-builders know as to the cost, and whether they have kept any account of it. He did not expect that it was going to cost one road the same as another; but what he was after was to find out whether the car-builders are keeping any detailed accounts. We have discovered now that some of the members have kept such accounts, and have got it down to a pretty fine point. I presume that Mr. Chamberlain has got it down to a nicety. I should also say that your friend Kirby did not know, and I rather reckon he has been on a sliding scale in regard to these charges. Mr. Adams has charged him so much, and he has thought that he would charge the same. I should judge that he really didn't know much about the cost.

MR. ADAMS.—That is your inference.

MR. CHAMBERLAIN.—There is but one fault that I can find with that question. It asks for the average without letting anybody know that it was to be asked for. If I could go to my shop I could tell you just what it would cost; but I can not do it here, because I have not the books with me. But if you ask me what it costs to fit old wheels, I can say that I know it costs all the way from 75 cts. to $1.50. If you will propound this question and ask for an answer next year, I will give you the figures. I feel somewhat ashamed to get up and make assertions before the master car-builders, because I have been called a "blower." Probably I can blow some; but I have generally got the figures to back me up. I have been accused, in the Eastern country, of being an extravagant man, because I spent $60,000 or $70,000 for the company on machinery; but I leave it to them to tell whether they have got the money back again or not.

MR. LEIGHTON.—I never for a moment thought that Mr. Chamberlain was a "blower." I have always

recognized his ability as a mechanic and as an organizer. I have also been in his shop, and I know that he is very nicely fitted up with tools. I think I understood him to say that he paid his wheel-fitter $1.60 per day.

MR. CHAMBERLAIN.—I do not know the exact figures.

MR. LEIGHTON.—We will say from $1.60 to $1.75 per day. I think you will recognize this fact—that the saving is not so much in the nice machinery that he has got as it is in the low rate of wages that he pays his men. That helps you out mightily. I can not hire (and I am one of the down-east Yankee fellows) a machinist for any thing like that kind of pay. They did say in New-Haven, when I went there, that I was a Boston drummer, and that there were a great many that would not work for me, because I drove the men so. I can hire men for $1.75 per day who will fit our wheels admirably. Mr. Chamberlain has every advantage. He has the nicest machinery, and he has got his machines placed right; he has hired his men for a great deal less than the rest of us pay. That helps him out a good deal.

MR. CHAMBERLAIN.—I will explain that. In every part of the country you will always find among the common laboring men around the shops, that there are always some who are better than others, and that there are always some kind of laborers who are adapted to a better class of work. The man I have on the wheel-borer was hired in that shop at $1.75 per day, when common labor was at that price. I put him on the wheel-borer, and he did so well that I finally gave him $2 per day. But if I should take the man away from the wheel-borer, he would not be worth any thing more than a common laboring man. Now he is getting a little more than a common laborer, and it stands him in hand to keep his job. It is the same way in respect to the axles. The men who turn my axles are not first-class men. Put them in a machine-shop and they can not stay there. But they are men who have a certain kind of ability, and can do a certain kind of work at a certain speed, and these are the men that I put upon the work they can do best. Then, we employ only the best tools, and we look after the men to see that they have tools that will do a good job. It is just the same with the man on the boring-machine. His tools are well taken care of. He has to take care of them, and he knows in just what condition they have to be kept. I do not want to say any thing about the smoothness of the hole, but it satisfies me. It takes from 70 to 80 tons to press a wheel on when it is off.

THE PRESIDENT.—The next question is:

In cases of the entire destruction of a car upon any railroad, belonging to any other company, what shall be the basis of settlement—the original cost of the car, or shall it be the amount of money that the same style of car can be built for at the time of settlement?

MR. ADAMS.—That seems to me to be a question that is practical, and one that frequently arises. Those of us who have more or less cars destroyed on other roads, have just such questions as that to decide. In my experience I have found that there was considerable difference of opinion with regard to it. My own conviction is that, when a car is destroyed, if it had been built during the war, when it cost twice, or at least half as much more than it does now, it would not be fair, when such cars were destroyed or broken up, to ask the company to build a new car in place of it, but that it would be fair to simply pay the actual value of the car. The question is whether the value of that car shall be based upon its original cost, less 10 per cent depreciation, which rate has been adopted by the Association. It seems to me that we should put the value of the car upon the basis of what such a car would cost now, instead of what it did cost five or six years ago. I would like to hear the opinion of members upon that point.

MR. DAVIS.—Does not the resolution we passed two or three years ago cover all that ground? I know that word was sent to me that a car of ours had been destroyed, and a proposition was made to settle for it on the basis of that resolution. I took the cost of building the car at the date it was broken up. I thought that I was right in doing so under the resolution that had been passed.

MR. VAN HOUTEN.—I think that a matter of that kind came up some time ago. So far as it has come under my observation on the Pennsylvania Railroad, if a car is broken up on another road, we are informed of the fact, and that the car is at a certain shop. I have a case of that kind now waiting my action. We have invited the master-mechanic or the master car-builder of the road to meet me on Monday, and say what that company shall pay our company for the damage sustained by the breaking of the car. I presume that the companies will settle upon whatever the master car-builder of that road and myself may agree upon.

MR. ADAMS.—There was a resolution passed that we should consider the depreciation of cars to be ten per cent per year; but so far as a valuation of the car was concerned, in order to get at a certain basis of estimate, I think that that was not mentioned.

MR. VAN HOUTEN.—I will simply say further that in regard to this matter I have taken the same position as Mr. Adams; that, in my opinion, the Pennsylvania Railroad Company should fix the value of those cars at what they were worth at the time they were broken.

THE PRESIDENT.—I think the question is a little indefinite. It asks for the price to be demanded for a car to be discharged from the shop, or the money required to replace the car. What shall be the basis of settlement—the original cost of the car or the present cost?

MR. ADAMS.—And with a depreciation of ten per cent upon the original cost or upon the present cost? It may not be expressed correctly, but that is what I wanted to get at in proposing the question.

THE PRESIDENT.—It appears to me that the only way to settle a matter of this kind would be to determine the value of the car when destroyed, and settle upon the basis of such value.

MR. ADAMS.—That would discard the ten per cent principle.

THE PRESIDENT.—You would get at the value of it by your ten per cent principle. A car that has been in service for seven years would naturally be of more value than a car that had been in service for twelve years, and of less value than a car that had been in service for only two years.

MR. VAN HOUTEN.—That does not always follow. I have seen cars that had been in service twelve years that had been put in good repair, and that were in better condition than those that had only served six years. I can go back from year to year, and tell when each car first came under my notice, and at what time such car was turned out of the shop. The company may show that a car is ten years old, and has been in easy service and in good condition all the time; and we may show another car which has only been in service three or four years, which is not in as good condition as the one which has been in longer service.

MR. FORD.—When we come to talking about settling for old cars on the basis of depreciation of ten per cent per year, I think that we are working on rather a wild principle. I was called, not very long ago, to settle for a car in use by the same company on another division. The car had been running for about fifteen years. If we were to settle for that on the basis of ten per cent depreciation for each year's use, what would be the result? We would have had to pay about fifty per cent over the first cost! I do not know how you are going to get out of that, if you go upon this basis of ten per cent depreciation. If you deduct ten per cent from its value for each year's use of the car, then when a car has been running for ten years, it can not be considered as good for any thing, if we carry out that principle. It seems to me that this matter is a very simple one for adjustment. If we take the basis of our settlement at the present cost of the car, it seems to me that we are doing what any one would admit to be an act of justice between the companies. We have no business to take the cost of a car built in war times, and undertake to say that we will hold the party to a settlement on that basis of cost. That would be very unreasonable, and no one would think of asking it. The only true plan upon which we can act on this subject would be to count the value of a car of the same class at its present cost, and then deduct whatever depreciation there has been in consequence of wear and tear.

MR. J. P. SOMERBY.—I understand that a car is always good for the old iron. It is always worth something for that. It is worth no more if a car is broken up fifteen months after it is built than it would be ten years hence, unless there is a rise or fall in the value of the iron. That is the way we would settle for cars. We consider that the car is always good for the old iron at the price of iron at the time, and it is always going to be worth the value of such iron.

MR. FORD.—I would like to ask Mr. Somerby if he would be willing to settle for the old iron for a car which had been running nine years, at ten per cent of the cost of the car?

MR. SOMERBY.—We always allow for the old iron at the price iron was selling for at the time the car was destroyed.

MR. FORD.—I understand this question to reach other cases than those where cars are totally destroyed. Very many of the cars that we are called to settle for are those which are injured so that they are required to go to the repair-shops; and it is necessary to come to some understanding as to the amount of damage done to such cars.

MR. WILCOX.—I would like to get some information in relation to this matter. I do not think that either theory of settlement is correct—that is, neither the ten per cent principle nor the present cost of the car. I hold that a car ought to be estimated with regard to its value the same as any other property at the time it is destroyed, no matter what it cost, and no matter what it would cost to build the car now. If we have a car destroyed we have adopted this plan of settlement, which seems to us the best way to get along with the least difficulty. I have a list of all the cars we have on our line; I know just when they were built and the time that they have been running, and the general condition that they are in; and I therefore know pretty correctly the value of each car. I can estimate the value very closely. I have a case of that kind now in hand. I have said to the other company that our car was worth so much money; we will make you a bill; you can send us back all the old iron; we will allow you current prices for the wrought iron and for the castings; when we get them we will weigh them and give you credit for the amount. We prefer to build our own cars, and we do not want to build any for other people, because our castings are somewhat different from those in common use, and we prefer to have uniformity in our equipment. That is the plan that we have adopted, and it has worked admirably. I do not think the other plan proposed will work, for it does not seem to me to be a sound one. It may cost $650 to build a good freight-car to-day; you may desire a car that is not worth $400, and it will not do to charge the road $650 for that car. There would be no justice in it, —the companies would not pay upon that basis. I say, therefore, that the proper way is to take the actual cash value of the car, charge it to the railroad company, give them credit for all the castings returned, let them pay the difference, and then we will build our own stock.

A MEMBER.—How will you get at the cash value of a car?

MR. WILCOX.—We know the condition of our cars well enough to fix the value very closely. We do not intend to overcharge any road, but we know the value, very nearly, of every car on our road. I now have a case of this kind with Mr. Kirby. I sent him the price, and he preferred to rebuild the car, and he is now rebuilding it, using, I suppose, the old material and the old iron. I have had no difficulty in this matter. I have settled, I suppose, for fifty cars within the last few years in that way. It seems to me a pretty satisfactory way, and I think it is a very just way.

MR. FORD.—How would you settle for a car that was only partially destroyed, so that it was necessary to send it to the shops to be repaired?

MR. WILCOX.—In a case of that kind, the company would send the car back to us, and we would make the necessary repairs to keep it running, and charge it to the company. In most cases, they repair the cars themselves. The plan that I speak of, refers to cars that have been totally destroyed, and which can not be rebuilt, but where the iron-work is pretty good.

MR. FORD.—I understand how we could settle for a car if it was taken to the shop, as we could make charges for the actual cost of the work; but if you want to settle for a car before you undertake to repair it, how will you arrive at the amount of damage?

MR. WILCOX.—I have sent my foreman, and have often been myself, to appraise the damages in such cases, where cars were only partially destroyed.

MR. ADAMS.—Unquestionably it would be far better if we could get at the cars in all cases, and see the amount of damage, and then we could more easily fix the value. There is hardly any difference in the judgment of car-builders as to the condition and worth of a car when damaged, or as to what it would cost to put it in order again. Very little difficulty arises upon that point. What I want to get at is this: a case came up on our road, two years ago, of which I had the settlement. The car belonged west of the Mississippi River. The trucks were good. The body was entirely destroyed. The car was not as good as a new one; and it would have been very unfair to have asked us to build a new car for the company, because the car was old, and had depreciated to a considerable extent in value; and besides, the car was very different in construction from ours, and somewhat complicated. I wrote to the car-master of the road, telling him the condition of the car, and stating that the trucks were not materially damaged; and asked him what he would allow me for the trucks and charge me for the body, and he sent me his price. I thought of sending the trucks home, but the freight on them would be too much. I then got permission to retain the trucks, and also got the car-master to give me the age, cost, and value of the car. We differed only $25, and this we divided and settled on this basis. Last year our freight-house at Springfield was burned and several cars destroyed. It fell to my lot to settle the damages with the different roads. We had some cars belonging to Canada. When these were under settlement, the man in charge placed a very high valuation upon them. He said that they cost him so much, at such a time, in gold. The value fixed by him was so much greater than what it would cost us to build them, that I would not listen to his valuation, and so I wrote him that the cars could be replaced for $200 or $300 less than the price he had put upon them. He then came down to a very fair basis, upon which

we settled. He looked back over his books, and found that he had paid so much money for the cars in gold, and he therefore thought that he ought to have that money back less the damages. We are frequently running cars from the Central Pacific Railroad, and are liable, of course, to break them up, and in such case we can not send the iron home, because it would cost more than it is worth, three times over.

The Convention then adjourned until to-morrow morning.

SECOND DAY'S PROCEEDINGS.

The Chairman of the Auditing Committee reported that the accounts of the Treasurer and Secretary had been examined and were found to be correct.

ASSESSMENTS.

The Commitee on this subject submitted the following

REPORT.

To the Master Car-Builders' Association :

GENTLEMEN : Your Committee find the annual expense to be about $725. We also find 196 members (or standing as such). At this rate, an assessment of $5 per member would be ample. The facts are that for the past year but 61 members have paid their assessment of $10 each. From this it would seem that it will require an assessment of at least $10. We make this statement for the information of the Association, and would recommend that some action be taken on the subject.

J. T. LEIGHTON,
J. W. HOLMES,
S. A. DAVIS, } *Committee.*

MR. C. A. SMITH.—It has been thought by some that $10 per year is too high an assessment, and that $5 is enough. The committee prefer to have the members of the Convention take action upon the matter, and determine whether the assessment for the next year shall be $5 or more. The committee do not feel like assuming any authority in the matter, and would therefore like to have some of the members make a motion in regard to the amount to be levied.

MR. DAVENPORT.—I think that this report does not do justice to the master car-builders as it stands. I do not think that the fact that only 61 members have paid their assessment necessarily implies that all the rest of the members intend to cheat the society out of its dues. I think it is largely a matter of oversight. Either they were not here at the Convention, or have not been notified, or have forgotten it. I think if our worthy Secretary will send a polite note to the members who are in arrears, inclosing a bill for their dues, that he will receive a prompt remittance in a majority of the cases. Of course, it is not right that those who come to the Convention should pay the expenses of those who do not come—that is, in the way of membership fees ; or that those who come should be assessed enough to pay all the running expenses, and let those go scot free who are members but do not take the trouble to attend the Conventions. If the committee think that an assessment of $5 per member will be sufficient to meet the expenses for the next year, there will probably be received from those who are owing their back dues an amount amply sufficient to make up any deficiency in the amount received now from the members who are present.

MR. C. A. SMITH.—I would say that all the members who have not paid their dues have had bills sent to them. I thought this was sufficient without writing them notes. Many have responded ; and undoubtedly it is an oversight on the part of most of those who have not responded. I do not have any idea that there are any members of this Association who will say that because they did not attend the Convention last year, they will not pay their dues ; and I thought that when I sent them a bill for dues they might remit.

On motion of Mr. Holmes, the report of the committee was accepted, and an assessment of $5 ordered to be levied upon each member of the Association, to meet the expenses of the current year.

MR. HILDRUP.—I now move that the Secretary be directed to draw on the members who have not paid their last year's dues. That will present the matter to them in a positive shape. Many on receiving their bills think that they will pay it when they come here. If they do not come, the matter slips from their mind. But if the subject is presented to each member in the shape of a draft, it is a matter to be met at the time ; and we will thus find out just who want to pay and who do not. There is no doubt that the omission is an oversight on the part of many, and that they will pay at once if it is called to their attention. I understand the motion to apply to the dues of 1874, and not to the present assessment ; only to the arrearages of the last year.

The motion was agreed to.

JOURNALS, BEARINGS, LUBRICATION AND PACKING.

MR. HOLMES, from the Committee on these subjects, presented a report. Its length precludes its insertion here. It mentions imperfect fitting, poor oil, overloading, inattention to the waste-packing, etc., as among the causes of hot journals ; recommends wool waste or long cotton waste for packing, with animal oil, or a manufactured oil in which animal oil predominates. The committee say little in regard to form of bearings, and make no specific recommendations. The replies of numerous roads to the committee's circulars are given, with the recommendation that the subject be continued another year.

MR. HOLMES.—I wish to suggest that in the appointment of this committee, gentlemen should be selected who live as near together as possible, so that they can readily communicate with each other. In regard to this report, I have had no conversation with my associates. One of them is in Texas, and the other is connected with the road that runs from Pittsburg to Cleveland. It should be so arranged that those who are appointed on a committee should be able to help each other. I do not believe in appointing a committee of three or four, and then letting one man do all the work. This is the first time that this subject has been brought before the Convention ; and I must say that I have been surprised in looking over the communications we have received in answer to the inquiries sent out. Some of the members took interest enough in the subject to answer the questions fully. There were but three questions asked, and they were asked in such a manner that they could be readily answered. The questions did not ask for a simple yes or no answer, but I think the answers given in some cases were not what we had the right to expect. Most of the answers were full and complete, but some were sent to me which, at the time of receiving them, I was upon the point of returning—and for this simple reason : that a man who is engaged in a position on a road, either as master car-builder or as foreman, should have knowledge enough of his business to answer the questions asked in some other way than simply yes or no. From the number of answers which were given in that form, it showed that the men had no interest in the subject, and did not propose to exert themselves at all in gaining information, either for their own use or for the use of others. I think that we, as men, whenever communications are sent to us, should do our best in answering, if we answer them at all. We are all at work for large corporations. It is our duty, while they employ us, to give all of our labors for their benefit ; and we do this by meeting in convention, as well as by devoting our time to the study of subjects which are to be brought before the Convention. We are collecting this information, not for the present time only, and not for our own roads only, but it is for the use of those who follow after us. The reason why I wish another committee appointed is, that I believe that another committee can do better than the last. I am not satisfied with what has been done. Mr. McIlwain was unable to meet with me to talk the matter over, but he was interested in the subject, because he answered my communication fully, but said it was impossible for him to be present. The representative of the road with which he is connected is present, and, of course, he carries out the views, and agrees with what brother McIlwain has said. It is very necessary for every committee to get together and talk over the matters which have been referred to them, and compare notes. In this way only can they make a satisfactory report.

A motion that the committee be discharged was then made and carried. So the committee was discharged.

MR. HOPKINS.—It seems to me that this subject of journals is one which is worthy of all the consideration which Mr. Holmes has suggested. Nearly every person present can recall instances, from his own knowledge, in which a hot journal has been the cause of loss and damage. Such an instance occurred a few years ago on the Erie road, where a hot journal cost the company $100,000. Hot journals are an everyday occurrence. The heating of a journal so as to detain the train upon the road must necessarily result in detention and trouble, if not in serious loss. If one train is delayed, that delays another ; and, to make up that lost time, extra speed must be resorted to, and extra speed is inevitably accompanied by extra expense in the way of wear and tear, as well as by increased risk of running off the track, collisions, and smash-ups. I am surprised that hardly any road reports much trouble with hot boxes. A gentleman who is present tells me that when he was on his way here from the West, the car in which he was riding had to have three new brasses put in, and each one burned out ; and yet I am informed that on some roads they very seldom have hot boxes. An old lady was asked whether mosquitoes did not trouble her ; while she was fighting them away most industriously, she said : "We never have them around here, but off yonder they have them." I really think that this subject of hot journals is entitled to more attention than has yet been given to it by those who are interested in the running of cars. Mr. Holmes suggests that those who are most interested in the subject have not given sufficient attention to the questions asked by the committee.

MR. HOLMES.—There is one other matter that I desire to speak of. In some of the communications there is a great deal of information contained which is not expressed in this report. I did not make a report of it because I would not betray the confidence of any one by doing it ; but in conversation with a gentleman connected with a road, he stated that they used upon his road for lubrication an oil for which the company paid nineteen cents per gallon, and that they were continually troubled with hot boxes ; that there was an oil sent to them, the price of which was thirty cents per gallon, and that it was used as an experiment upon the same car, but upon opposite sides. The journals were of the same size, the brasses of the same form, and the packing material of the same kind ; and on one side of the car the nineteen cent oil was used, and on the other the thirty cent oil. The result was, that on the side of the car on which the nineteen cent oil was used, they were obliged to oil four times to once on the side where the thirty cent oil was used. They continued the experiment until the thirty cent oil was all used up. The gentleman made a report of the fact to his superior officers, showing conclusively that the thirty cent oil was by far the cheapest ; but, instead of ordering more, they threw it aside and continued to use the nineteen cent oil. They said, in effect, we are buying oil for nineteen cents ; what is the use of paying thirty cents ? They did not take into consideration the amount of trouble which the cheaper oil caused in the wear of boxes, nor the friction caused by using such material. They did not take into consideration the increased expense resulting from the use of poor oil in the wearing of brasses and journals. The better the lubricator is, the more money is saved. Of this I am satisfied.

MR. HOPKINS.—In confirmation of what Mr. Holmes has just said, I will refer to the fact that on one of our leading railways, centring in New-York, an experiment was tried, some years ago, of using the very best lard oil in the summer, and the very best sperm oil in the winter, on a certain class of freight-cars. At the same time, a very intelligent and highly-paid man was engaged to lubricate the cars. The result was, that each locomotive, all other things being equal, pulled just ten per cent more cars than they pulled before. All other things were equal, except that they consumed less fuel. The trains ran with greater regularity. You see that one half of this increase in drawing capacity, or five per cent, would have paid for all the oil and all the labor, and the complete inspection of the whole matter. This was an instance where good material and intelligent labor paid the company perhaps better than any other thing they ever did. These are facts which may be reduced right down to statistics ; it is not a matter of speculation ; it is a fact running right along for a series of years, and susceptible of proof. In the light of these facts, it is very evident that the economy of buying poor oil, and employing poor labor, and saying to the car-master, in effect, "You must buy your oil at so much per gallon, and employ cheap labor," is penny wise and confounded foolish. But, aside from that, it is time that railroad companies understood the fact, that when they have a hot journal which could have been possibly avoided, they willfully imperil the lives of passengers and employees. They have no right to do this. I believe that there is a very efficient remedy for this trouble, and that is, to say to the car-masters, you must take this subject into your own hands ; and although it may cost a little more money in our shops for good and intelligent workmen and good materials, the recompense will be in avoiding the delays on our trains and the mishaps and accidents which cost so much money. Do it as cheaply as you can, but do it well. Let excellence be the standard of work at the shops, and not the least possible price for the work.

MR. ADAMS.—Last February I put a new car out of our shop about the time that Brother Holmes's circulars came around. It occurred to me that I would like to ascertain, for my own satisfaction, exactly what it would cost per mile for oil and waste to run that car. I therefore measured the oil carefully, and weighed the waste that was put in. I have kept a careful account of all the oil used in that car since. I am fully satisfied there has been no oil used except what I have put in. It is a matter of no little surprise to me that a car can be run so well with so little expense. The journals have never been worn, and the car has never lost a trip to my knowledge, or been delayed a minute. There has never been any unnecessary detention in any way, shape, or fashion. The car has had a little oil put into it once a week, and the oil used amounts in all to 14 gallons. The car has made 20,400 miles in this time ; it has regularly

run 200 miles per day. I used 1½ pounds of waste. The whole expense of running the car so far amounted to $6.60. Dividing this by the miles run, we find that the cost of oiling per mile was $\frac{33}{100}$ of a mill, which is less than one third of a mill per mile. The oil used was the ordinary mineral oil, for which we paid about thirty cents per gallon. It was a passenger-car, with the standard axle and the Hopkins brass. I believe that one third of a mill per mile for oil is a correct statement. I do not say that all cars can be run in that way, but I believe they could be with the same care and attention in the selection of oil. If one car can do this, why can not others? There are various reasons why they do not. If you fit a car up in that way, you calculate to look at it and see that it does just so. It is usual for car-builders to say that "our cars" run all right, and that foreign cars make all the trouble; but I apprehend the fault lies in not giving sufficient attention to the foreign cars when we receive them. It is our business to see that they are in proper condition to run over our lines. If the inspectors are careless, the responsibility comes upon us for breakages that may occur.

Mr. Hopkins.—The use of an inferior oil necessarily involves the use of extra power, which costs a great deal more than an abundant supply of the very best oil. A car can be run with very little oil. As an experiment, I ran, two years ago, a Pullman palace car from Jersey City to Chicago, applying but half a gill of oil per box for each round trip, after the first packing of the boxes. The car ran until the wheels were worn out, on that supply. The car was carefully watched all the time, but it would not be safe to run on that supply as a general rule. The thing that costs us most is not the regular supply of oil, or the excessive supply of oil, but it is the burning out of the the oil and waste, and the detention of the train for the want of a broad margin in the way of oil which was, perhaps, not absolutely needed at the time it was supplied. I do not say that a large margin is necessary if we have good fitting and careful attention. We can then run a car with very little expense for oil.

Mr. Van Houten.—I have heard of a railroad company buying eight or ten gallons of oil and throwing it away afterwards, just because their journals and bearings were not properly fitted, and because the oil was not properly applied. I believe that, as Mr. Hopkins says, if one car ran from here to Chicago on half a gill of oil, and comes back perfectly safe, a hundred cars can do the same thing if the same care is given to them. There may be some difficulty in running freight-cars, because on most of our roads freight-cars can not receive the same attention that is given to passenger-cars. We may let a car go away to-day and not see it again for three or six months; and we can not possibly give the same attention to those cars that we can to passenger-cars which we see more frequently. Mr. Adams spoke of a small quantity of oil being used—fourteen gallons for twenty thousand miles, including the original packing and what was necessary to keep it up. It is a question with me whether, with a proper application of oil, any packing at all need be used. I will give you a little of my experience in the matter of testing oils. A sample of oil was brought to my attention, and I submitted it to the Vice-President, who said to me that it was a good thing, and he would like to see it well tested. Having that authority to give it a fair test, I put it under a passenger-car. I used a little over four ounces of the oil; and though I can not give from recollection the number of miles made, I will venture to say that, on that four ounces of oil to a journal, double the mileage was made by the car than Mr. Adams speaks of. I think it run a little over 60,000 miles. I could see the car three or four times a day, and I noticed it particularly, because I wanted to see how it would work. There is no doubt a great waste in the use as oil, as will be seen if you examine the track over which the cars pass, and examine the wheels when the cars come into the shop. You will find them covered with dirt and oil half an inch thick. If the railroad companies would look a little closer into this matter, or allow their master car-builders to do so, and depend more upon their judgment as to what ought to be done, I think they would save money.

Mr. Adams.—It seems to me that such a wonderful saving as that would warrant the company in continuing the use of the oil, even if they were obliged to pay a large price for the patent-right. It is wonderful that the Pennsylvania Railroad Company, a company supposed to look at things very closely, did not further avail itself of such a saving. I did not make my statement of the experiment I tried, with a view of telling a big story; I simply stated it as a fact which happened to be within my knowledge.

Mr. Van Houten.—I so understood you, and I gave *my* fact to go with yours, for what it is worth.

Mr. Adams.—I am surprised that your company does not insist upon the use of that oil altogether.

Mr. Ford.—There is one cause for hot boxes which has not been mentioned, but which it is worth while to speak of, and that is because so many of our oil-boxes have the lids screwed on solid. Another cause is, that so many of the lids are off altogether, thus allowing the dust and dirt to get in. I think that either cause will often produce hot boxes. On our road the lids are screwed on solid, perhaps with two screws, and there is no way of getting oil into the boxes without spending ten or fifteen minutes' time in taking the screws out and putting them in again; and the consequence is that those whose duty it is to oil the boxes neglect to attend to them, their excuse being frequently—and a very proper excuse it is—that they have not time. Trains go through or past a certain station where it is the duty of the man in charge to oil them; but he has no time to do it, although he may ascertain that the boxes are getting warm. When the lid is screwed on in that way, it is impossible for him properly to do the work. I think that one essential feature in connection with all our freight-cars is that the lids should be hinged so that the packing can be easily reached and the oil easily applied. There is one other frequent cause of hot boxes, and that is on through cars heavily loaded, when they come in with hot boxes, the men in charge put in boxes that are too small for the journals, and which have a bearing upon the edges of the brass instead of the centre. We probably all understand and will admit that a brass should have a bearing on the journal at the centre and not at the edges.

Again, if the collar of the journal bears hard upon the brass at either end, it will cause a hot journal. I wish to say, in explanation of the fact that I did not report to the committee on this subject, that I have no recollection of receiving a circular. In fact, there are two or three of the circulars this year which I have no recollection of receiving. So far as I did receive circulars, I endeavored to reply to them.

Mr. Steinbach.—I would ask what kind of journals, as a general thing, is it that get hot? Are they the standard axle, or are they the smaller sized journal? We have got quite a number of cars on our road, and we used to be considerably worried with hot journals while we used a small journal; but since we commenced using larger ones—larger, I believe, than any other road in the country, for our bearing is 8 inches by 3¼ on our ordinary freight-cars—we have had less trouble with the heating of the journals. In fact, out of the many thousand journals that we have running, I have known of but one solitary journal becoming hot, that is, of the 8-inch journals. I have seen a number of smaller journals that were heated. We have had more or less trouble this past winter on our passenger-cars. There we use a 3⅞ journal, which is larger than that used by most roads. Several experiments have been tried on our road, and special attention given to particular cars. When we have a new car, we fit it up with great care, and every journal and every box is carefully attended to. We take care to see that all the boxes of the car are packed exactly alike. Sometimes when the car starts out, two or three of the boxes get hot and the others do not; now, why is that? The same material is used, the same oil, the same packing, the work is done by the same man, and yet some of the journals will get hot and we can not help it. Other journals will run for a long time, and there will be no trouble with them. We have tried different lubricators and oils on the same cars, one on one side of the truck and the other on the other, yet with the same results that I have stated.

Mr. Davenport.—You have a 3¼ by 8 inch journal, I believe. How many journals of that size have you had broken?

Mr. Steinbach.—I don't remember of having any journals broken since the very cold winter of 1867. Our journals, as they first come out, are 3⅞, but on our coal-cars they are 3¼, and on our tenders 3¾ inches. During that cold winter we had trouble with a number of them, and that is why we changed the size from 3¼ to 3¾.

Mr. Hopkins.—I think my story about the car running to Chicago needs a little explanation. The oil used was very fine sperm oil. While I would not say that the car was not successfully run in all respects, yet I would not recommend anybody to undertake to run their equipment for ever so small a road with that same degree of economy; for I think that you would find that it was not economy in its final results.

Mr. T. B. Stewart.—I think it would be well at this point to inquire of those who have had foreign cars come on their roads with hot journals, whether any of them were of the standard pattern, because it would seem a little strange that all of these standard journals should run so well at home, and yet get hot when away from home. If there is no trouble with them, either at home or abroad, then it is clear to my mind that the adoption of that bearing is a sure remedy for the trouble complained of.

Mr. Chamberlain.—We have some of the New-York Central cars running over our road to Boston. Whenever I see one of them, I look at it to ascertain what condition it is in. It has probably been running twenty-four hours before I see it, yet you could not tell, from appearance, but what the journals had just been oiled. There has never been, on the Boston and Albany road, from the very first time that the standard car-axle came on the road, whether a home or foreign car, a hot journal.

Mr. Leander Garey.—I am confident that this matter of hot boxes and proper lubrication has not been sufficiently understood nor thoroughly canvassed, nor examined with the care that it is entitled to receive from the master car-builders. It is evident to me, from what experience I have had, that when heavy loads are carried at such high rates of speed, and over rough joints, the lubricator must, of necessity, be crushed out from between the journal and the journal-bearing, letting the two surfaces come together, thereby causing friction and heating. If a lubricator is not applied immediately, you have, as a consequence of the friction, a hot box. That being the case, if our freight-cars are running, say at twelve miles per hour, and the packing is a bed of mud, with a little waste mixed with it, which will not filter the oil, but allows it to lie dormant in the bottom of the box, even when hot, and which will permit the oil, when poured in at one end of the box, to run out at the other—why should we not have hot boxes? If you take a number of cars that pass at a given point, where your inspectors are placed to examine them, and see how many they are obliged to inspect in a given time, you will find that you require an impossibility in expecting him to attend to his business properly. There are hundreds, and, I may say, thousands of freight-cars that run until the boxes are hot, and are doctored by the men on the train until they can be run into some station, or placed upon a side-track and then doctored again and started off. When once heated, the journal-bearing is virtually destroyed, because the composition is so deteriorated that it is liable to break to pieces or become heated again at any time. I doubt very much if any one has ever attempted to compute the cost of a hot box. You will find that the journals that break are granulated in the shoulder, and the granulation is caused by the heating, and the jarring caused by the revolutions of the wheel. If you would have a detailed statement made of oil used, and the number of cars run, the number of hot boxes and of journals broken, the number of trains detained on the road, the quantity of oil used by the freight-men between the point where they take the train and where they leave it, I think the information would astonish many of you. It is necessary that we should have these detailed accounts. This cheap transportation, which is so loudly called for, and which we must provide, will compel every railroad to know precisely where every dollar of expense that is put upon the rolling-stock is applied. I can call to mind one road which followed this careful inspection up for a few months, and the difference in the quantity of oil used in four months previous to such inspection, and the quantity used the present year, with such inspection, amounted to a saving of about 448 barrels in the four months.

Mr. Stewart.—It has been stated that one box on a car would become heated and the others would not, when all were fitted exactly alike. I think that fact shows that they were not all alike, and it would be well for us to examine and find out what the difference is. We may think that two boxes are exactly alike, and still they may differ very much in operation. If one box on a car becomes heated, while the others do not, that fact shows that we are not as perfect or as accurate in our work as we think we are. Therefore we should investigate the matter and find out what the difference is, and what can be done to remedy the difficulty.

Mr. Van Houten.—I have no doubt that all the journals referred to were properly fitted before they were put on the road; and we might say that a smaller journal would run just as successfully if properly fitted. I remember an instance where a large-sized passenger locomotive on an eight-wheeled truck, with a 3½ inch journal (¼ of an inch larger than the standard), started up the road with all that tremendous weight on it, and soon there was a hot journal. The small journal was blamed. The locomotive was sent back to the shop, and I was requested to examine it, and see what was the trouble. Some of our people thought it was necessary to get a larger truck, with a 4-inch journal, in order to carry the locomotive to its place of destination. The matter being under my supervision, I took the wheels off and took the brasses out, and I found, sure enough, that it had been heated, and simply because the bearings did not fit. I took all the brasses out, and examined them. After giving those brasses a thorough fitting, and the journals a thorough smoothing up, and lubricating thoroughly, I sent it out again without shifting the engine. That was several days ago, and I have not heard from it since, and so I take it for granted that there was no further trouble with hot journals on that

truck; if there had been, we should have heard of it. I think, therefore, that, to a great extent, the cause of hot journals is because the bearings are not properly fitted, and the boxes are not properly packed, and that the heating is not due so much to the small journals.

MR. CHAMBERLAIN.—I think the journals on our road are perfectly fitted, in the first place, and in the second, we use Hopkins' lead-lined brasses. When brasses are wanted for any car, the foreman gives an order for so many. He is credited with the old ones, and the new ones are charged to him; and they are put in by men whom we pay at the rate of $1.25 per day. I never see any of the brasses except when they come in. When they were first introduced on our road, of course, I took considerable pains to try them, and see that every thing was correct. I tried them so often and so thoroughly, and found that they were so correct, that now I do not examine them unless there is a hot journal. We have turned out on our road as many as twenty-four new wheels and axles, with new brasses on, for use on an express train; but have never yet seen or heard of a hot journal. They were large journals. During the last year and a half, the Boston and Albany road, under their passenger equipment, have not had a hot journal, nor one warmed up. I have the mileage reports of all the conductors on the road, with a statement of all accidents and delays to trains, and I have no record of a hot journal.

MR. STEWART.—Have you had the most trouble with large or with small journals, with regard to heating? And what is the proportion?

MR. CHAMBERLAIN.—I can not give the exact proportion, but I should say that two thirds of them were small journals. About a year and a half ago we had considerable trouble with hot journals on the New-York and Boston Express line, and Mr. Adams and I could not agree as to the cause or remedy, although I am not responsible for the hot journals on that line; if I was, they would be remedied; but so far as the Boston and Albany cars are concerned, we used to have as high as fifteen hot journals per day. I had spoken to Mr. Adams about the matter several times, and he thought that he was all right, and I thought that I was all right. I wanted to use the Babbit metal, and succeeded at last in having it used; and I have never had a hot journal when Babbit metal was properly applied and fitted. We went up to Springfield for an experiment. Mr. Adams had half of the journals packed with lard-oil, and I went up with the same oil, and used my Babbit boxes on the other half. I thought that if lard-oil was good with brass, it was good with Babbit. We had four of Babbit's on one side of the truck, and four of brass on the other side. Well, we both came out ahead, but I was not satisfied with the result. What I wanted to try was the black oil. Finally, we introduced Manley's lead-lined brass, and since we have used that we have not had a hot brass. You may try ten thousand of them, and you will not have a hot journal. You may think that this is "blowing," but it is not; I am telling you just what can be done; and I speak from actual experience, not only on freight, but on passenger-cars.

MR. VAN HOUTEN.—That speaks pretty well for small journals.

MR. DAVENPORT.—We admit that; only it takes a great deal less oil to run the big ones.

MR. CHAMBERLAIN.—Yes, and it takes a little less brass. Next year we will be prepared with details to give you the exact wear, in every way, shape, and manner, not only in oil, but in journals, and in journal bearings.

MR. STEWART.—If a box is filled with Babbit you can melt the Babbit all out, and then oil it, and have it worn down smooth to the brass; this looks as though the brass was a pretty good thing, without any thing else with it. I have done that over and over again. It is very sure that the brass will not melt and get out of the way, but it will retain its place, even after melting, so that there is far more probability of its retaining its place, and not heating. If Babbit begins to heat, it makes an imperfect bearing; but when you can wear the brass right down smooth, it shows the brass to be good.

MR. CHAMBERLAIN.—What I claim for lead-lining is that it is soft, and will swage on the journals if there are any imperfections, and fill them all up. I know that on our road we have got out of lead-lining a little over the thirty-second of an inch clear, over 37,000 miles, and have not yet got through the lining down to the brass.

MR. HOPKINS.—I think the metal used by Mr. Chamberlain is not what is generally understood as the Babbit brass, which is brass cast so that there is a recess in it into which the Babbit metal is cast; but the bearing which he refers to is one that in itself would be complete without the addition of the lead-lining, which is simply placed upon the surface of the final packing, and in effect constitutes simply a mould into which the journal bends itself by pressure, thus getting a complete fit at once without the necessity of wearing so as to make it conform to the journal. Where journals are considerably worn, they are almost invariably worn unequally. If brass of the ordinary construction is used, it will yield only at certain points, but the lead yields at those points of severest pressure, and fills up at the points where there is not so much pressure. Consequently the result which Mr. Chamberlain has found to follow from the use of this metal on his road follows from its use on all roads where it has been tried. I only speak of this to correct what seems to be the general understanding as to the Babbit bearing. It is not what was originally understood as Babbit's bearing. The lead is an auxiliary bearing; nothing else.

MR. ADAMS.—I move that this subject of Hot Journals, Bearings, Lubrication, and Packing be continued in the hands of a committee, consisting of Messrs. J. W. Holmes, M. P. Ford, and William F. Smith, these gentlemen being near each other, and able to get together in a couple of hours, without expense.

The motion was agreed to.

THE PRESIDENT.—The next question is as follows, and is understood, of course, as referring to foreign cars:

In case of a car having been received by a railroad company, and no objection made to receiving the car, but after the car has made some distance on the road the journals get hot so as to cut and have to be removed, to whose expense should the repairs on the axle be charged?

MR. CHAMBERLAIN.—The car-master of the road receiving it ought to pay for it, because he was so careless in letting it come on to the road in such condition.

MR. ADAMS.—Out of his own pocket?

MR. CHAMBERLAIN.—I am not particular whether out of his own pocket or not.

MR. WILCOX.—In that case, it seems clear to me that the road receiving the car should replace it, and pay all damages and put it in good condition.

MR. VAN HOUTEN.—If such a car is received by our men, and comes upon our road and gets hot, or any thing happens to it after having been received by the inspectors at the point at which it comes into our hands, have we got to bear the expense of repairs?

MR. ADAMS.—We have got one or two cases of that kind now in dispute, where companies claim that we should pay for the axle damaged, our cars being on a foreign road; and we have refused to pay for the axle, but required them to put in a new one. They insist that we should give them good axles, and we say if our cars get heated on their road the fault is theirs, because they were not oiled properly. We guarantee our axles and wheels. They take the ground that from the general custom each road guarantees their own wheels and axles under a fair usage; and because of that guarantee we should pay for the axle. We do not understand it so, and I want to see if the views of other members are the same as ours.

THE PRESIDENT.—Has any one any further remarks to make on this subject? If not, I will ask the next question:

How many pounds should be allowed for a removal from a car-axle in finishing the journals and fitting the wheels of a 4½ inch wheel-seat, with a 3¼ x 5½ inch journal; and a 4⅝ inch wheel-seat, with a 3½ x 6 and 3½ x 7 inch journal; and a 4⅞ inch wheel-seat, with 3¾ x 7 inch journals, respectively? In other words, how many pounds should be allowed difference between the forged and the finished axles of the various sizes?

MR. CHAMBERLAIN.—Does that refer to the practicability of working? Is that what you are trying to get at?

THE PRESIDENT.—Most railroad companies buy their axles, and if the forgers should leave on 25 lbs. of iron that was not required, and it had to be turned off in a lathe, it would be false economy. In the first place, the manufacturer would get pay for material that the man using it did not want; and he would have to turn it off in a lathe, at an expense to himself, in order to get rid of it. The object of the question is to ascertain how many pounds should be allowed as the difference between the axle, when it leaves the forge, and when it leaves the lathe.

MR. CHAMBERLAIN.—I think, Mr. President, that that is one of those things that no fellow can find out; but if you really want to know, I can tell you pretty correctly in about a week from now. A certain amount of metal must be left on the axle in order to get below the sand, if there is sand in it, but what the exact amount is I am unable to say without trying an experiment. There is a great deal of difference in the manufacture of axles with regard to working close to the size.

THE PRESIDENT.—I will state for the information of some who may not understand this, that on examining this matter, I find that the amount removed from the axles of certain sizes varies from 22 to 68 lbs. Now, if 22 lbs. is enough, ought we to pay for the extra weight when 68 lbs. have to be removed?

MR. DAVENPORT.—I am glad this matter has come up. There is another point that has not been touched upon yet, and that is this: You will remember when you turn off the outside iron you are throwing off the best iron. The inside iron is the poorest. Therefore, it happens that you pay for a great deal of iron that you must turn off and throw into the scrap pile, and so are unfortunately compelled to pay for the best iron and then to throw the best iron away. I had a little talk with our President some time ago, about this same matter, but I did not know that it was coming up before the Convention in just this shape. The question was discussed by us, whether it would not be possible for railroad companies to control this matter. It is quite possible that if you insist that the man who forges your axles shall forge them close, it will be done; but if you do not insist upon it, of course it will not be done. Those who forge axles are men like ourselves. It is money in their pockets to forge them large. When they forge an axle close, it costs them more to forge it. They occasionally get an axle thrown back upon their hands that will not finish—will not true up. It would be greatly to the interest of railroad companies to look at this matter. What our President has told us is too true, and in fact he might tell us a little more truth of the same kind. There is a good sized colored individual in this inclosure, I can assure you. I know of certain forging companies that purposely forge large. They sling the iron in recklessly, and let it go; and the railroad companies pay for it. The forge-men furnish the axle at so much per pound. The result is that we have been compelled to say to some forgers, Your axles are not to exceed, for a given pattern, a certain weight. If you put in any more iron than that, we will not pay you for it; and you must make your axles so that they will true up, or we will throw them back on your hands. We are willing to pay an extra price to have them conform to these conditions. We can afford to. Railroad companies can afford to pay better prices than they have any idea of for closer forged axles. I know from practical experience in these things that a great saving can be effected if this matter is looked into. We have kept track of it in years past, and are very particular about it now; and we get the axles down from 15 to 17 pounds right straight along; and we do not think we are honestly dealt with if we do not.

MR. ADAMS.—I think that Mr. Davenport is right. I recollect when I was connected with the Lake Shore Road, we had axles from one forge that did not turn off on an average over 15 pounds. They were the ordinary axle of that time, and many of the same length are on the same road now; they were about 6 feet 7 or 8 inches, I think, over all, and 4¼ or 4⅛ in the wheel-seat. They can be forged, and have been forged regularly without a loss of over 15 pounds. Of course a large axle would be in increased proportion; but I should think that 25 pounds would be a large allowance for the largest axles now in use.

MR. E. VARNEY.—I would state in regard to standards, that our axle weighs 375 to 378 pounds, which is 100 pounds heavier than our old patterns. When they are turned, ready for the wheel, they weigh 352 or 353 pounds. That makes about 25 or 28 pounds that is turned off. I do not know but we could get them down to a little less. I can not tell you how much we turn off from smaller ones.

MR. C. E. GAREY.—I had this matter under consideration about a year ago, and I thought I would make some experiments with the standard axle. I found that this axle, taking four of them right out of the pile, without sorting at all, weighed respectively 401, 410, 397 and 398 pounds. After they were fitted and ready for the wheels, the same axles weighed respectively 358, 359, 353 and 355 pounds; thus making a loss in turning them up ready for the wheels of 43, 51, 44, and 43 pounds. It seems to me that 20 pounds would be ample for the standard axle.

MR. PARTRIDGE.—I have not the data and can not speak by the book, but my impression is, in regard to a statement made to me by a gentleman last winter, that he had axles very nearly the size of the standard axle turned up, and that, time and time again, when he had taken the pains to compare them, he found that 20 lbs. was all that he was having to throw away. He said that he had previously thrown away an immense amount of iron, but had gone to the firm from whom he was buying his axles, and by providing templets, and getting his specifications pretty exact, he succeeded in reducing the waste iron to about 20 lbs. per axle.

MR. E. A. OLMSTEAD.—With the standard axle the average is about 374 lbs., and when turned, 338 lbs., leaving 36 lbs. to be turned off. The standard axle averages about that—some of them much less; with a 6 foot 9 inch, and 6 inch journal, they run about 346 lbs., and when turned, 321 lbs., leaving 25 lbs. turned off. As a rule, they vary but a very few pounds from that.

DRAW-BARS AND BUFFERS.

The Committee on Draw-bars and Buffers presented the following

REPORT.

To the Master Car-Builders' Association :

GENTLEMEN: Your Committee on Draw-Bars and Buffers, in presenting their report on this subject, labor under some embarrassment from the fact that they have not been able to agree upon any plan satisfactory to themselves or which is calculated to remedy the evils which now exist with respect to these attachments to freight-cars. These evils are great and difficult to overcome, and in the opinion of your committee, their magnitude is not as fully realized by car-builders and other railway officers as it should be. There is no doubt that many accidents would be avoided by an improvement in the existing methods of connecting cars. The expense and loss incurred by many railway companies in the matter of links and pins alone, constitute a very large item. Some roads report it as high as $18,000 and $20,000, while on others it is estimated even as high as $60,000 per year; and in addition to this must be added a large sum for injuries sustained by employees, for doctors' bills, the wages of men off duty while suffering from such injuries, and others who have been mutilated for life and retained as pensioners upon the road, or performing merely some small service. All this is directly attributable to defective drawing and buffing arrangements. The committee would call attention to the defective manner in which many draw-bars are attached to the bodies of cars, as being also a source of danger and accident and consequently expense, such draw-bars being placed considerably below the line of resistance, and giving a leverage over the already weak fastenings, so that any unusually sudden shock will break them away. Such attachments, wherever they exist, should be changed so as to bring the fastenings as near to the most effective line of resistance as possible; they should be very strong, and we think a stronger spring should also be used, with a greater range of motion, thereby lessening the shock to the car.

Your Committee, during the past year, have had their attention called to a great number and variety of new models and plans which are claimed by their inventors to be improvements. But we have thus far seen nothing that in our opinion meets the demand, or that would to any great degree be an improvement upon present methods; yet some of these devices have some merit, but fail in the most essential points. Your Committee have given considerable thought and attention to this subject, and although we are not prepared to recommend any definite change or plan, yet we believe that certain principles should be embodied in whatever plan may be ultimately presented for adoption: First, the draw-bar should be a self-coupler, avoiding the use of links and pins, in order to save the enormous expense incurred in their loss, as already stated; Second, the arrangement for buffing should be very strong, and placed on the line of effective resistance; Third, the whole must be so arranged as to be used in connection with our present draw-bars, as it would be entirely impracticable, even if desirable, to attempt to introduce any thing that would not work with our present rolling-stock. We also believe that we see strong indications that the activity of inventors will in another year in all probability produce something to remedy these defects. We would therefore recommend that the subject be fully considered and discussed, but that no definite action be taken in disposing of it.

F. D. ADAMS,
L. GAREY,
C. A. SMITH, } *Committee.*

MR. S. GRIFFITH.—I wish to make a statement in reference to this important subject, the correctness of which I believe will be confirmed by the experience of every one present, and especially of those who have had charge of car repairs, and which is this: That at least 50 per cent of the cost of what is called the running repairs of railroads, is caused by the breakage of draw-bars and their attachments to the cars. It frequently happens that by the breakage of these bolts on a heavy grade, or by the splitting of the draw-sills, the whole end of the car is pulled out, and if the car happens to be loaded with bulk grain, you know what the consequence is. This is no fancy sketch, but a common occurrence, even when the best and most improved draw-bars are used. The cost of repairs and the loss by detention and damage to freight, although very important items, are by no means the most serious results of such breakages. A more serious matter is the delay of trains and the increased danger of collision from approaching trains. It very frequently happens that the rear end of the train runs into and wrecks the forward part. The duty of the master car-builder, in such cases, is not only to repair these broken parts, but to strengthen, by some means, the parts which are weak, or to adopt something better than we now have in use. In this view I have given considerable attention to draw-bars, and I will try to show you what has been the result of my endeavors, so that you can judge whether I have succeeded or not. Our company got a continuous draw-bar, connecting through the car and through the train (a model of which was shown by Mr. Griffith), so that each car is drawn by its own draw-spring, and does not take one pound of the weight of the balance of the train. By this arrangement, each individual car in the train has its own weight to draw and nothing else. Consequently, in a train of twenty cars, the forward car, next to the engine, would have only $\frac{1}{20}$ part of the load to draw which it would have with the old style of draw-bars. In such an arrangement there is comparatively nothing to break the draw-bars. Another very important feature is, that every car is drawn from the rear end by the rear draw-spring instead of the forward part. When we have a broken car out on the line of the road, we order the train-men to hitch it on behind the caboose and bring it into the shop; and by this arrangement, each car in the train, although it may be the forward car, next to the engine, has only its own weight to draw, and therefore runs on as lightly as though it were hitched on behind the caboose, but with this very important advantage—that it is shoved along by the rear end of the car. This being the case, in a train of twenty cars, the forward car having less than $\frac{1}{20}$ part of the weight of the train to draw that it would have with the old draw-bars, we secure an arrangement which is stronger and simpler and of less cost than in the old way; and I think that this point will be of sufficient importance to recommend it to your notice. There is also another point to which I wish to call your attention: it is the efficiency of the arrangement as a buffer, or, in other words, its ability to resist the shock or blow received in collisions. By reference to the model, you will see that the shock of the collision is received upon the strongest part of the car, and, consequently, no ordinary blow will do it any damage. You will not need to carry any dead weight, and can therefore save that expense, and also save the lives and limbs of the persons coupling the cars. The line of draught is in the strongest part of the car, and the standard height of the draw-bar is maintained, which is a part which must not be lost sight of in making any change in draw-bars. I think it important that the standard height should be kept up in any change that we may make. I think that you will all agree with me that the draw-bars and buffers, considering the amount of work which they have to do, and the abuse or rough usage which they receive in the service, are notoriously the weakest part of car construction, and the point which should receive the first attention of those having charge of car-works.

I wish to call your attention to an article written by a very sensible gentleman and an A No. 1 mechanic. I refer to Mr. Reuben Wells, of the J. M. & I. road. He says:

"Another defect is in the strength of the draught-arrangement. The long list of disasters, delays, and expenses resulting each year from the weak and defective draught-arrangement, draw-bars, etc., if detailed would 'even astonish the natives.' When security in this particular can be assured, under ordinary circumstances, at so small an additional cost, it is singular that this defect is not remedied."

An inspection of the model will show that it is not dependent upon a bolster for its support, but has a solid bearing above the bed of the bolster, and that it is secured also by the usual number of bolts. It will be necessary to make some change in detail in applying this to the different cars, because the cars are not all constructed alike; but there will be no difficulty in applying it to any style of car by making some little modification in it. I firmly believe that if this system should be adopted and properly applied, there would be no further trouble in making an effective draught-arrangement. The only practical test which we have had of this continuous draw-bar was this: I put it upon a train of 50 cars on the I. C. & L. railroad six or eight months ago; 20 of the cars have been running in the stone trade between Chicago and Cincinnati. They made 320 miles per day, during all kinds of weather last winter, and so far there has been no sign of breakage, and not a cent's worth of repairs.

MR. ADAMS.—I would like to inquire if the spring on the forward car, or the one next to the tender, draws any less weight by this arrangement, or if there is any less power brought to bear upon it in this case than there is ordinarily?

MR. GRIFFITH.—I think you will see that there is no weight upon the spring except what is put upon it in ordinary cases. The continuous draw passing through each car, draws the train, of course, but each car is independent of every other car, and consequently each car has only its own weight to draw.

[A recess was here taken to allow the members to inspect the model.]

MR. PARTRIDGE.—A question was asked, just before recess, with regard to the draw-springs and their action in this continuous draw-bar. We might illustrate it in this way: If we take a rod and attach it to an engine, and then set a spring with lugs on the rod, it will represent precisely what is done in the coupling of cars. The back end of the car rests against a spring. The front spring has nothing whatever to do with the spring at the rear of the car; but each spring at the rear end carries that one car; and the draw-bar is continuous and independent of the spring, running right through the train from the engine to the last car. So that each spring does nothing but cushion the shock of its own car on a continuous rod right through the train.

MR. STEINBACH.—We have used a continuous bar upon our road for a number of years, exclusively upon our passenger-cars. Instead of having springs as here shown, we have had them in the centre. The trouble with us was, that we used with a wrought iron bar a 3 by 7½ bar, 18 inches long. We used that for a number of years on our passenger-cars, and still have it on a few passenger-cars, but the trouble has been that they would buckle up and break; and we found that iron would not do as well as wood. We use the best ash wood that we can get. On some of the freight-cars of the Baltimore and Ohio Railroad, the continuous bar is used, and I must say that I think they are the most inconvenient cars to repair that have come to our shop. Almost always when these cars come upon our road, their buffers are so much higher than those of our ordinary cars, that the rods buckle up. They use a 2-inch rod right through, and those rods have given us more trouble than any foreign cars that come over our road. If this rod would not buckle, it might do, but on our road we have frequently had trouble from that cause.

MR. ADAMS.—We have learned from experience that the trouble in our cars is generally the result of concussions. We want in some way to avoid those concussions. The pulling is of less damage to the car than the buffing.

MR. FORD.—In reference to the buffing, I must say that I think Mr. Griffith has overcome that difficulty very well. If you will look at the model, you will see that he has directly in front of each bolster a slotted bar securely bolted to the centre of the sills. He not only has the benefit of the bar-bolts, but he also has the benefit of the bolster directly back of that. We generally have to depend upon the back follower to receive the concussion in the present arrangement of our cars, but in this, in place of the back follower, we have a block which is solid, with the exception of a hole large enough to admit the rod through the block. In that respect it seems to me that Mr. Griffith has a very strong arrangement, and I think it is as strong as any I have ever seen on any car for receiving the back stroke or concussion.

MR. VAN HOUTEN.—I have very little to say on this subject; but what I have to say will corroborate what Mr. Steinbach has said. This arrangement was used on the New-Jersey Railroad and Transportation Company, about thirty-five years ago—just the same principle, except that instead of having a spring at either end, we had a large spring hung in the centre of the car, and a rod connecting each way with that spring. But it was forever getting out of order. Although we made it very heavy, this long rod running through and taking the shock of the whole train, would buckle up so that we lost all the action of it, and it became stationary rather than a spring. At a more recent date, a party in Philadelphia obtained a patent upon the same principle, and we tried that arrangement for a while on the Pennsylvania Railroad; but we found the same objection to it. Still later, there was another patent obtained for an arrangement slightly different from this, by a Mr. Cobb, who was the master mechanic of the Pennsylvania Railroad at the time. In my observation all these arrangements for securing action through the whole length of the car, and working by rods, as this does, have been failures. I can not see sufficient difference between these arrangements that I have had experience with and that of Mr. Griffith, to warrant any other conclusion than that his will also be a failure.

MR. CHAMBERLAIN.—The gentleman seems to have lost sight of what the member who brought this model intended to represent by it. He claims that in the old-fashioned way they used to use this system of draw-bar, it would buckle up. Mr. Griffith claims that this is something that can not buckle up unless your spring entirely gives way. If your spring fails, then, in case of collision or concussion, there would be a chance to bend that rod; but I can see no other way in which it can be done. If the draw-bar is slotted a little farther than is represented in the model, that supposed difficulty would be overcome, and it would not then buckle up at all, because your bars have come together before the spring is entirely exhausted.

MR. HILDRUP.—I think the plan adopted by the Baltimore and Ohio Railroad is a little misapprehended in reference to the application of the continu-

ous rod. A year ago I had occasion to apply to the master mechanic for plans of their standard iron coal-car. Probably that is the way which they use the continuous bar at this time. The rod is a continuous rod, and the spring is fixed in the centre of the car. That spring is used to pull by, and only to pull by; for the bumpers ought to stop the momentum of the train and protect the car as much as possible. They apply a wooden spring on the end of the car, a plan which is generally in use in Pennsylvania on coal-cars, although used with various modifications. The draw-rod or draw-spring is not used at all in stopping cars, but that is done by the wooden springs on the ends of the cars. To my knowledge this arrangement has been in use on the Baltimore and Ohio road for a number of years; and in that modified form they now use it, I think, on all the standard cars. I would ask Mr. Steinbach if I am not correct in saying that they bump by a wooden spring on the end of the car. That was the plan furnished to me. I only wanted to state the plan in use, so that it might be placed on its own merits.

MR. STEINBACH.—This is used mostly on freight or box-cars that go over our road. I do not know what the arrangement is in other cars, but there is a wooden spring bumper on the ends of our cars.

MR. DAVENPORT.—I think that we must give Mr. Griffith credit for meeting a want felt at the Cincinnati Convention, and which was expressed there. By the appliance which he has introduced, he certainly does give us a continuous draw-rod; and he protects the rod from buckling, unless you smash your car all to pieces. He certainly does give us the draught on the back end of the car, and if you secure your bolsters as he seems to contemplate, and have an additional bumper between the bolsters to take the blow on the end, I think it will make the strongest arrangement that I have yet seen. It may be that some modifications are necessary to secure the most desirable results, but I think he has given us the correct principle. His rod may not be sufficiently heavy, but the idea seems to be there; and if we were sincere at the Cincinnati Convention in desiring a continuous rod, we have it now, and so adjusted that there can be no buckling, and that the draught shall be throughout the train, and on this rod, each car sustaining only its own draught. If we were not sincere, and did not want any such thing, of course we deceived Mr. Griffith and also ourselves. I am very much pleased with the model, and it seems to me that it covers the point.

MR. C. E. GAREY.—I have given considerable attention to this idea of a continuous draw-rod. Theoretically I have one all worked out and applied to the cars, but not practically. It embodies the principal ideas that Mr. Griffith's plan does, with a few modifications. In the first place, he makes a solid rod the length of his car. I make a hollow rod, except at the end, thereby getting a lighter rod and a stronger rod—that is, theoretically. Instead of using keys and slots, I use a nut on the end of the rod, which does away with all keys and slots, and when applied in the same manner draws the car from the back spring, and the frame of the car sustains the shock of collision. I think that the model here is deserving of very careful attention, and I must say that I think that some of the gentlemen have misconstrued its working. They have got a wrong impression from something which they have used before which has not proved satisfactory. By careful study of this thing it appears to me that a continuous rod or draw-bar can be applied to cars practically, and with great advantage. The addition of a self-coupler to this device would make the thing complete. That was embodied in my theoretical plan. A continuous draw-rod or draw-bar which shall draw each car independently by itself, and a self-coupling hook at the end of the bar, is exactly what we want for freight-cars.

Mr. VAN HOUTEN.—I desire to rectify an impression that I have done a member an injustice, and think it is but honest that I should do him justice now. By a close examination of this model I find one feature in it that is somewhat different from the kind of continuous rod that I spoke of a short time ago. This continuous rod, it seems, does not, upon closer examination, take the place of the bumper.

THE PRESIDENT.—Has any one present any statistics showing the cost of maintenance of draw-bars on any given number of cars on any road, or any details by which we can arrive at the cost of maintaining draw-bars and buffers? Has any one any statistics that will give the number of cars that are side-tracked or sent to the shop on account of the failure of draw-bars?

MR. PARTRIDGE.—Two years ago I had access to the papers of a railroad as to the cars that went to a certain repair-shop, the number of cars, the amount of damage done to them, and the total expenses for repairs; in fact, I had access to the repair bills from one shop, and I had the interest to take one month's papers out of the files and examine them. I think that there were about 200 cars put on the side-tracks for repairs, and that the cost of the repairs varied from 50 cents up to about $20. Out of 128 accidents, the repairs of which cost between $5 and $20, 51 of the accidents were to draw-bars and to draw-bar attachments. I counted other months, but not quite so accurately. I found that there was very nearly one half of the repairs, costing over $5 each, that were due to draw-bars and buffers, or to drawing apparatus of some sort.

MR. VAN HOUTEN.—How long did the company let that kind of bumper remain on the road?

MR. PARTRIDGE.—That was general repairs.

MR. VAN HOUTEN.—I understood you to say that it was for bumpers alone.

MR. PARTRIDGE.—It was on the bumpers and draw-bars of all the cars on the line. I have found in every shop where I have had access to the statements of repairs that more than half of the repairs on freight-cars, or at least half, are for something connected with the drawing apparatus. That statement includes foreign as well as home cars.

MR. ADAMS.—I am very glad indeed that Mr. Griffith has brought this matter forward in the manner he has. It shows us clearly that we are making some progress. I see plainly that provision is made so that there is no possibility, under ordinary circumstances, of doubling the rod up. I like the general principle of it, but I think there is a very material lack in it still, which is referred to in our report. There is a general demand, by the public at least, if not by the car men—there is a general call all over the country on the part of outside people, and a great deal of fault found by outsiders in regard to it, because we do not have self-coupling arrangements, as the newspapers say, to save the lives of our employees. I presume that many of the statements made in regard to this matter are exaggerated; but still I am inclined to think if we could get a self-coupling arrangement which would free us from the use of the link and pin, and which would be practicable, it would be of very great value. That, in connection with Mr. Griffith's arrangement, would be something that we have long anticipated and desired. The self-coupling part of it, without the pin and link, we have not yet got. We have not yet seen any thing that was satisfactory. I do not see any objection to Mr. Griffith's plan; in fact, I think it is a great improvement. I like Mr. Garey's suggestion in regard to a hollow rod. If we have not already iron which would be suitable, there is no doubt it could be manufactured. The weight of the solid bar is an objection, as it adds considerable dead weight to the car, because the rod should necessarily be of pretty good size; while a rod like a gas-pipe would be very much lighter, and would give more strength in proportion to the weight, and perhaps accomplish the object as well, if not better. The same weight of iron put into the form of a hollow pipe is, of course, very much stronger than a solid rod. I had no conception of the loss resulting from the use of pins and links until I began to investigate the matter myself; and I am sorry now that I had not begun the investigation earlier. I find that it is a very large item of expense, as we say in our report—equal to the salary of a good many men every year on all the roads. Of course, the larger the roads the larger is the amount. The proportion is kept up pretty nearly, but it may differ in different localities. On smaller roads, of course, it does not amount to so much. I speak of our own road, the main line of which is 200 miles long. We have about 5000 freight-cars. You can get an idea from that of the expense to other roads, if the proportion is kept up. So far as we can ascertain from our books, the expense from this item alone amounts to $20,000 or $25,000 per year. I am informed by our President that on the New-York Central the expense is probably two or three times as great. This is really a very serious matter to the companies, and it seems to me that if we set our wits to work we can avoid that expense. We ought to make some effort to secure an attachment or connection between cars that will be as effectual as the pin and link. We have an almost endless variety of models of patent buffers. I am informed by some parties that there are over 900 patents on self-couping buffers. If this is so, it is rather a discouraging thing for a man to rack his brains on in order to get out any thing new and useful. Whatever new plan is devised must be adapted to our present rolling-stock One feature in the plan of Mr. Griffith strikes me as objectionable, and this is the making of a two-inch hole through a wooden bolster where the greatest strength is needed, and also another hole vertically for the centre-pin.

MR. GRIFFITH.—I made a recess in the cast-iron centre-bit, and let the head of the king-bolt come under the body of the bolster, and not through it. The rod comes over the head of the king-bolt.

MR. VAN HOUTEN.—Then how do you get your king-bolt out in case of necessity?

MR. GRIFFITH.—You can not get it out without jacking the car up. There are some rods that have no king-bolt passing through at all. My idea was that the arrangement was an advantage instead of a disadvantage in freight-cars.

MR. L. GAREY.—The links and pins used on a railroad, one would think from the way they disappear, are like the pins that are made for ladies' use. Millions are made every year, but no one knows what becomes of them. I hope that in another year, when this Convention meets again, every man present will have some statistics showing the expenses on the road with which he is connected, for this item; how many cars monthly are put upon the side-track, or sent to the shop on account of the failure of draw-bars; and through that information the companies may be induced to give their attention to providing something, either through the inventors or through men connected with the departments, which shall do away with the evil. The adoption of a perfect draw-bar and buffer would necessitate the dispensing with links and pins. There is a serious doubt in my mind if the two can be connected together—that is, the drawing and the buffing—successfully in one attachment. The buffing should come upon the most effective line of resistance, which is directly through the lower timbers of the car. I would ask inventors to turn their attention to providing something by which we can dispense with the links and pins, and be self-coupling; and give us a buffing attachment which will be sufficient for the service required. Mr. Griffith has produced the best arrangement that has been presented so far. If he can go a little further, and make it self-coupling, and dispense with the use of links and pins, and then give us a perfect buffing arrangement, we shall have just what we have been so long looking for.

MR. ADAMS.—Did I understand Mr. Griffith to say that his arrangement was patented?

MR. GRIFFITH.—There is no patent upon it at present, but application has been made for one.

MR. HOPKINS.—I would suggest that in ascertaining the cost of draw-bars, links, pins, etc., it would be well for members to separate the cost of the draw-bars destroyed by buffing, from those that are destroyed by being pulled out. In my own experience, I have found that about seven eighths of all that were broken, were broken by compression. We must provide strength in the car-body to withstand the concussions. It is well known that the power of wood to stand a tensile strain is seven times as great as its power to resist a percussion strain; consequently we ought to have a car-body strong enough to stand both. Perhaps a continuous attachment right through would relieve the car of a great deal of the strain. We have all, when standing in a car when the engine has started, felt the car jump up and down, and it was plain to perceive that there was a shock, not only in the direction of the train, but we could perceive that all the timbers of the car were bent by the strain brought to bear upon them. For this cause the car-frame is subjected to very serious damage in the starting of the train.

MR. CHAMBERLAIN.—I would like to ask Mr. Hopkins to explain, if he wants to separate the buffing from the drawing, how it is to be done. It is well known that many of the draw-bars that have been entirely broken out of the cars, are brought to the shops, while a great many of them are left upon the road. When a car comes to the shop, how can a car-master tell whether the buffer is drawn out, or whether it is buffed up? I would like to give all the information wanted, if I only knew how to do it.

MR. HOPKINS.—I would suggest that reports be obtained from every train conductor, stating how the accidents occur. There is one other point that, it seems to me, is hardly dwelt upon enough, in relation to self-coupling draught-bars, and that is that this Association is in duty bound to furnish some device that shall save the great number of lives annually sacrificed by the coupling of cars.

MR. STEWART.—It may be a fact that many of these accidents result from the carelessness of the employees, in not preventing an undue strain, either in drawing or in compression. If so, that ought to be provided for. I have many times seen trains started with a speed that was quite unnecessary, and have also seen them stopped so suddenly as to do injury when there was no occasion whatever for it. It may be that the officers of the road could save a part of this expense and injury, and very easily, too, by stricter orders with respect to the use of the train in coupling and uncoupling.

MR. J. H. F. WIERS, Atlantic and Great Western, was understood to state that on his road the conductors and engineers were required to make a monthly report to the master-mechanic of every accident rendering repairs necessary, and an explanation of the precise way in which the damage was done; and that this careful inquiry had resulted in increased attention and care on the part of those having charge of trains.

MR. FORD.—There is one thing which, I think, has been overlooked by the companies generally in connection with draw-bars, and that is, that proper attention has not been paid to keeping the bolts tight. I think that one great trouble with our draw-bars is

that they are permitted to become loose because of the shrinking of the timber after it leaves the shop, and no attention is paid to tightening them, and the result is, there is a little lost motion on the bolt, and in a very short time a broken draw-bar. I know that this is a difficult matter to attend to, but still I think it would pay the companies well if the car-builders would require their men to keep the bolts of the draw-bars tight. Our cars are now running from one end of the country to the other, and it may be a very difficult thing to do, but still it is worth the effort.

MR. VAN HOUTEN.—I would like to ask Mr. Ford if he does not sometimes find that the men will run a hot rod down and get the hole so big that the bolt will not touch at all?

MR. FORD.—That is often the case; and we also very often find that bolts are broken off between the draw-bar timber and the middle sill of the car; but I think that this results from the nuts being permitted to get loose on the bolts.

MR. MCVAY.—There has been something said about the necessity of having a committee to prepare blank reports, so that we can obtain information which we are now unable to get. A gentleman on my left states that on his road they have adopted a system of reports which are, I think, just what is wanted by all railroads. I think that we should bring every man to account for each draw-bar that is broken. I know that it is almost proverbial that railroad men are a reckless set, and that they very frequently incur risks that are entirely unnecessary. But if they were held responsible to some extent, even though they were only required to give an explanation how the draw-bars and bolts were broken, or why the minor accidents were allowed to occur, I think the result would be beneficial, and that this recklessness to a great extent would be prevented. I think that it would be well for this Association to devise some plan for securing such reports, and the better way probably would be to get up a blank which could be used on all the railroads. I think it would be well enough for the officers of the Association to get up a blank report and send it to the master-car-builder of each road, and ask them that they get the consent of their officers to have this information come into the shop in such a way that we can make use of it. It is important that we should have some data to work upon. It seems to me that we are groping in the dark. One road has adopted one system, and another road another system of reports, but there is nothing uniform.

THE PRESIDENT.—I would suggest that there is a difficulty in having one kind of report used on all the different roads. I think that it is with the car-department alone to give this information by requiring a report from the inspector who finds a draw-bar bolt broken, or any part about the car requiring repairs. There are some roads which require these statistics weekly or monthly, and they are very interesting; but I think that a difficulty would arise in making the same kind of blanks to apply to different roads under different circumstances. I think it would be better for each master car-builder to prepare blanks suitable for his road, and to have those reports made to him through his men.

MR. MCVAY.—It is a difficult matter for the master car-builder to introduce any thing new in the way of getting up reports on his road; but if there was something recommended by this Association as necessary for the benefit of each road and for our information, it would not be so difficult, and the plan would meet the approval of railroad officers. I should be much obliged to the gentleman who stated that there was a plan of record on his road as to the breakage of cars, if he would send me one of those blank forms. I think that benefit to the companies would result from their use; at any rate, it would tend to make the men more careful if they were held to a stricter accountability. He states that they have had fewer accidents of that kind since the plan of reporting was adopted; and thus the master car-builders and men are relieved of a great deal of unnecessary work. I have often felt that I was doing work that was done simply to let off the men that had caused the accident. On our road we make a weekly statement of the number of cars that come into the shop for repairs, and the nature of the repairs, but that is the end of it, so far as the cause of the breakages is concerned, for no one is held to any responsibility for the breakages.

MR. WIERS.—I would say that such has been our course; and it is amusing to see the engineers come into the master mechanic's office and give excuses for pulling out the draw-heads. They are required to come there and make some explanation in regard to a loss or breakage. In regard to blanks, I think if we could arrange to have a form filled up so that at the end of the year each one of us could get up a report and send to the Convention, it would have a very beneficial effect; and it would give us an idea of the different workings on the different railroads. When a train-man breaks any thing carelessly we make him pay for it—that is, if it is a small amount of five, ten, or twenty dollars, we take the sum out of his pay; and we find by experience that when you strike a man's pocket it hurts him worse than anywhere else, and makes him more careful next time.

MR. STEWART.—If there was a uniform account kept, and reports made the whole length of the road, we would be better able to determine just where breakages occurred. Now it is very easy for the men to say that a bar was broken before the car came on their road, but if an account is kept where the breakages occur, then it can be charged to the proper man.

MR. CHAMBERLAIN.—I would like to make a suggestion with regard to those blanks. I know something about the blanks on the Atlantic and Great Western Railroad. They were introduced by Mr. F. W. Cummings, who at that time was the superintendent of motive power on the road. A later superintendent abandoned them. It is of no use for the master car-builders to introduce such blanks on their railroads unless they can get the master mechanic and the superintendent to acquiesce in their use. I have been there and know how it is. I tried to carry on the system, and did save thousands of dollars on the Atlantic and Great Western road, when it was in operation, and in a very few months after it was abandoned we could see the difference in the increased cost of repairs of draw-bars. The blank used on that road was perfect in every respect, but it is of no use to attempt to use it unless the superintendent or master mechanic will pull on the same string with you.

MR. PARTRIDGE.—I move that a committee be appointed on the subject of collecting statistics on car repairs, and forms for keeping the same, and that such committee report at the next annual meeting of the Association.

MR. FORNEY.—Before that motion is put I would like to say a word or two in regard to it. The committee who are appointed to present subjects for consideration at the next Convention have had this subject under consideration; and I think, therefore, it would be better to slightly modify the motion. I think it would be impossible for any committee at the next Convention to present a complete system of accounts for the car department of railroads. The subject is so complicated and so little understood at present, that it would be folly to attempt to present any system that would be complete in every part. I think that during the next year each member should keep such an account as he thinks is needed, and present it at the next meeting, and we can then work out some system which would be nearer complete than any thing we can now do. If we attempt to make a system at present we shall be quite sure to omit something that would be needed. I think, therefore, it would be better to make the committee one which shall consider the subject rather than attempt to mature a complete system.

MR. PARTRIDGE.—We may not be able to present a complete system of statistics, but we can ask for certain facts in regard to draw-bars; we can ask for certian specific information with regard to oil and waste; and we can ask for information with regard to many other things as to which the car-builders can answer in their shops without the necessity of the road adopting any particular system of reports.

MR. VAN HOUTEN.—It seems to me that the appointment of a committee of this kind would give to the members of it a vast amount of labor to perform which would not amount to any thing. I agree with Mr. Forney in his statement that, if every master car-builder will keep some account of what he does, and whether it is to be done because of the breakage of draw-bars, or in consequence of the breakage of axles, or wheels, or whatever it may be, such a statement as that would give us a great deal of information that we need. On our road we have certain forms of reports which are made to our superintendent of motive power. The master mechanic has his form of report, and the master car-builder has his form. Besides the reports that I am called upon to make to my superior officers, I have been in the habit of keeping a little record of my own of certain things which happen, and I can get better or as good information from that as though I had all the reports returned to me a week or two before this Convention, and had been allowed to see every thing that had been done. I keep copies of the reports that I send out of the office. This plan would have to be confined to one's own shop. Because, while I am presumed to know about what is being done at my own shop, I do not know any thing about what is being done at Altoona, or Pittsburg, or Harrisburg, or any other point. I find that I have enough to do to attend to my own business. If every master car-builder could come here to our next meeting, and bring information to us of what he has done himself or knows of others having done, and the cause of all these things being done, I think it would cover the whole ground.

MR. HOPKINS.—I would not wish to oppose the appointment of a committee to solicit forms of reports from the various car-masters, and to prepare such forms as appear to them will answer the purpose of collecting information desired. Although we can not report a perfect system of accounts, it seems to me that we can do something, and there is no time so good to commence a thing that ought to be done as the present. Many of us do not appreciate the fact that the internal commerce of all the civilized nations of the earth is done upon railways. The magnitude of our railway interests is certainly sufficient to demand the very best efforts of every man in gathering all the facts that may come within his reach that will be of service in reducing the cost of operating the roads, or in rendering the operation of the roads more safe to life and property.

The question was then taken, on the motion of Mr. Partridge, for the appointment of a committee to report a system of blank forms for the use of master car-builders, embodying information concerning car repairs, etc., and carried; and the President thereupon appointed as that committee, Messrs. John McVay, J. H. F. Wiers, and T. B. Stewart.

MR. STEWART.—Would it not be well for us to make a request to superintendents, asking them to require each train-master or conductor to give an accurate account to the men having charge of the repair departments, of the way in which the drivers or buffers are broken? If such a request comes from the superintendent, they will feel compelled to comply with it. Then let the master car-builder make a report, and give an accurate account of these repairs during the coming year. Then, at our next session, we can show something about the causes of so much breakage of draw-bars and buffers.

MR. J. F. ELDER, Pennsylvania Railroad.—If this committee, in asking for information, will go to the Railroad, they will get all the information they have been asking for this morning. A master car-builder Superintendent of Motive Power of the Pennsylvania can only report for his own division and his own shop. He can not report for the whole road; but the superintendent has this information compiled at the general office, and is prepared to give us all that we wish to know. I do not wonder, therefore, that Mr. Van Houten voted against the motion. I give him credit for doing it. He knows where this information comes from, and he knows that it is accurate. We have a system of reports that is as complete as it can be made, and I have no doubt that that information will be freely given at any time.

MR. PARTRIDGE.—I think that perhaps Mr. Van Houten and Mr. Elder are laboring under a little misapprehension. We know that there are some railroads that have just such a system of reports as other railroads need. When I made the motion for the appointment of a committee, I had in mind the road to which these two gentlemen belong, and also one or two other roads where they have a perfect system of accounts, and very complete forms in use. Now, it would be a great value to the members of the Association and the railroads, if those blanks could be obtained and sent to the other roads, and they be induced to adopt them.

FREIGHT-CAR TRUCKS.

The committee on this subject submitted the following

REPORT.

To the Master Car-Builders' Association:

GENTLEMEN: Your Committee appointed at the last annual convention, to whom was referred the subject of the "best style and most economical truck for freight-cars; best position and hanging of brakes, and position of brake-shaft (right and left-hand) when standing on the car," beg leave to report that interrogatories in the form of a circular were sent to car-builders and those having charge of passenger and freight cars, and there have been received in all fifteen replies. The following are the questions asked, and the answers to each:

1st. Do you consider an iron or wood-frame truck the best? and what are your principal reasons for preferring one or the other?

Eleven replies consider iron frames the best; two consider wood frames the best, and two consider wood and iron combined the best.

2d. Is a truck with swinging-bolsters, in your judgment, preferable to one with a rigid frame? and if so or not, please state your reasons.

Eleven consider swinging motion best; two, rigid the best, and two doubtful.

3d. Can a locomotive, under all circumstances, start and draw more cars with swinging-bolster trucks than with rigid-frame trucks? If you use swinging-bolsters, please send drawings showing position of hangers, and also state your opinion of the merits of such trucks.

Eight answer in favor of swinging-bolster, and six in favor of rigid frame. No drawings received.

4th. Should the side-bearings take any portion of the weight, and if so, how much ?

Fourteen answer, as little weight as possible ; and one, that they should take all the weight.

5th. What kind of side-bearings do you consider the best ?

Seven answer, flat hard iron or steel ; two, rollers ; one, iron or hickory ; one, curve stands.

6th. Would you recommend for either iron or wood frame truck a short spring in jaw over the boxes ?

Eleven favor the use of spring, and four do not.

7th. Do you have any difficulty in keeping iron frame trucks square ? Do you brace such trucks ? and if so, in what manner and with what results ?

Eleven have no trouble and use no bracing ; three have trouble, but give no plan of bracing.

8th. What distance from centre to centre of axle would you recommend as best ?

One recommends 6 ft. ; five, 5 ft ; one, 4 ft. 8 in. ; one, 3 ft. 9 in. ; one, 4 ft. 7 in. ; three, 4 ft. 10 in. ; and one, close together as possible.

9th. Is a centre-bearing truck, in your judgment, easier on the track and wheels than it would be with a portion of the weight on side-bearings ?

Ten favor the centre-bearing ; four do not.

10th. How much leverage should be allowed on the brake-levers to secure a sufficient braking and the preservation of wheels ?

One reports 2¾ to 1 ; one, 2 to 1 ; and four, 4 to 1.

11th. Should freight-cars have brakes upon both trucks, and should such brakes be placed outside of the wheels or between them ?

Six are in favor of brakes on one truck ; eight, on both trucks ; twelve are in favor of hanging brakes on outside of wheels ; and two, in favor of hanging them between the wheels.

12th. Are your brakes so constructed and applied as to give a uniform or equal pressure upon each wheel ? If so, please send description and tracing of such brakes.

Five answer, yes ; six answer, no ; no tracings received.

13th. Which do you consider the best plan of hanging brakes, to body of car or truck-frame ?

Four are in favor of hanging to body, and ten to truck-frame.

14th. Which, in your judgment, is the best position for the brake-shaft ? Should it be on the right or left-hand corner of the car as you stand facing the car ?

Twelve report left hand ; two report right hand.

15th. Would you, with the consent of your superior officers, favor the idea of a national or standard freight-car truck, duplicate in all its parts except wheels and springs ?

Ten would favor the idea ; three would oppose it ; and one would favor it, in case the truck was constructed in accordance with his judgment and experience.

Judging from our own and the experience of many of those answering the inquiries, we would consider an iron truck the most economical for freight-cars ; and that swinging-bolsters are of great advantage, both in the power acquired in moving trains, and in the wear on track and cars. We consider a truck for freight-cars should be as near centre-bearing as possible ; that the side-bearings should be made flat and smooth, of some hard material, such as chilled cast-iron or steel ; that when the style of truck will admit, it is best to have a spring over the box or journal ; but do not consider this spring a necessity, however, in the construction of a good truck.

We have found no trouble in keeping iron trucks square, and have used no extra braces for this purpose ; we consider bracing unnecessary where trucks are properly designed and well built. Would consider 5 feet from centre to centre of axle a proper distance to place wheels in freight-car trucks. As to having brakes upon one or both trucks of freight-cars, the committee do not entirely agree. It is generally deemed sufficient for ordinary roads to have brakes upon one truck of each car ; however, Mr. Kirby, of the Lake Shore road, considers it advisable to have brakes upon both trucks, and believes that the additional cost incurred in so doing is saved in the wear upon wheels and the stoppage of trains. We would consider brakes hung outside of wheels preferable to those hung between the wheels, as we think they are more effective and can be repaired with greater convenience.

We consider it immaterial whether the brakes are hung to body or truck of car ; if they are properly arranged, they are equally safe, effective, and durable. Would consider the proper position for brake-shaft to be upon the left-hand corner, as you stand facing the car.

To have a truck duplicated in all its parts (with the exception of wheels and springs) would be considered of vast advantage to railroad companies, particularly to trunk lines where there is an interchange of cars.

D. Hoit,
John Kirby,
W. F. Smith, } *Committee.*

The report having been read, Mr. Van Houten moved that it be adopted as the sense of this Convention.

Mr. Partridge.—There is one point in that report that I should decidedly object to, if it is to be adopted as the sense of the Convention. The report says that the committee received only fifteen replies to their circulars. That statement is very much of a piece with a good many similar complaints that we have heard here—that our members do not answer the circulars sent to them. I have thought over the matter a good deal, and I have concluded that there is something to be said on the other side. I come in contact with many of you in many different ways. I find that, although you do not, perhaps, send any formal replies to the questions asked you, your neglect is not because you do not take any interest in the matter. But you are practical men. You are dealing with wood and iron, and materials of that sort, which can be handled, and when you sit down at a table and attempt to send a written reply to the circulars, you find it rather hard work. I know it would be rather hard for me to get up from my desk, and go out and direct a crowd of men engaged in the repairing of cars, because I am only used to the swing of the pen. But you could all make your reports in wood or iron, if models were asked for, and the result would be that we should get as fine a set of models as has been gathered by any association of men in this country. I have noticed that whenever a member can make a practical answer to a question, in the way of keeping statistics, or of preparing and sending in a model, we get answers to our inquiries that are worth having. The models that have been sent in from car-builders are spoken of very highly by outsiders who visit the rooms of the Association. I am confident, therefore, that your neglect to send answers to our circulars is not because you lack interest in the Association or in the questions asked. I would therefore suggest to the committees, in future, that if they can get their questions in such form that they can be answered by models, they will get a great deal more information from the members of the Association, and just the information that is wanted.

Mr. Van Houten.—I do not know how it may have been with other members who failed to answer circulars, but, in my own case, I can say that I received but four circulars, and that they reached me only four days before I started for this Convention. I answered the four. I sent one answer to the chairman of the committee, thinking it would reach him before he got here ; and the other three I directed to the parties, at the Grand Central Hotel, because I could not, in the interim, answer them, and have the answers reach the committee before they left their homes. Four days was all the time that was given to me for answering the circulars, and I dare say that other members were in the same position—they had not time to answer them, and therefore did not.

Mr. Hopkins.—It appears to me that we are hardly ready for the adoption of this report, as indicating a standard for car-masters. The remarks of Mr. Partridge appear to me to possess very great merit, in the way of suggesting that car-masters make their answers in wood and iron. It appears to me that it would be better for us to accept this report, instead of adopting it. Continue the committee another year, and ask the members to send in models.

Mr. Adams.—It appears to me there is something a little foggy about this matter of "receiving," and "accepting," and "adopting" reports. I do not think the subject is fully understood. I am free to confess that I do not understand it. When a report is made, it is looked upon as an act of common courtesy, at any rate, on the part of a convention, to accept the report, unless the committee want merely to report progress, and then the matter is turned over into their hands again. But if there is any intention of continuing the committee, then we should accept the report which they make. I do not understand, however, that accepting a report is equivalent to its adoption, or as indorsing all the statements and recommendations contained in it. This I would be unwilling to do, as regards this or other reports that are made here. I am not ready to adopt every detail. I suppose the object of Mr. Van Houten, in moving to adopt the report, was simply to bring it before the Convention for discussion.

Mr. Van Houten.—That is what I intended.

After some further discussion on the point of order, the Chair announced that the time had arrived, under the rules, for devoting half an hour of each session to receiving and answering questions.

The President.—The first question I have is as follows :

What number, or how many new car-axles should be fitted to wheels and journals, in ten hours' labor, by one man ?

Mr. Adams.—That would depend entirely upon the kind of lathe he used.

Mr. Chamberlain.—You may give two men precisely the same kind of lathes, yet one man may excel the other by double the amount of work. The difference is not altogether in the lathe. It depends a good deal upon the man, and a good deal upon the tool he uses, and a good deal upon the feed that he carries. I have known a time in my own shop, on the same lathe that we are now using, when all that a man would get out in ten hours' work was four axles with 6x8 inch journals ; at the same lathe, but with different tools, a man has been able to get out sixteen axles in ten hours.

Mr. Adams.—Does the question mean the wheel-seat and journal, or only the journal ?

The President.—The object of the question is to draw out from the members what they are doing, that we may compare the experience of one member with that of another. If a railroad company are running machinery, the use of which requires five men to do one man's work, it is high time that they knew it. Some companies do not know the difference between running good machinery, even with poor men, and running poor machinery with good men, because the matter has never been brought to their attention.

Mr. Hopkins.—I take it for granted that the information asked for is, what can a good man turn out with a good lathe ?—not what a poor man can turn out with a good one, nor what a good man can turn out with a poor one. We want to know what a good man with good machinery can do.

Mr. Somerby.—If a good man is wanted anywhere, it is on the fitting of axles. I think that is the most important thing about railroad construction. I would never have a poor man work on an axle or wheel if I could get a good one. I pay the highest wages in my shop to the wheel and axle fitter.

Mr. Hildrup.—Does the question embrace an inquiry as to what is the best tool, and the best size of axle lathe, and the size and dimensions of the spindle ?

The President.—The question is designed to bring out the actual work performed in the various shops, and by comparison to ascertain the best method of working, the best tools, etc.

Mr. Hildrup.—We use what would be called an extra heavy lathe. We use a single tool. We think if a man does justice to one, he is doing a good day's work. We use a fast feed and a very heavy tool in the lathe. We have the machine so solid that there can be no tremble.

Mr. Davenport.—We meet a difficulty here ; and I knew that the fur would fly when we began to ask these questions. The members do not seem inclined to say much about it. The difficulty is just here : You have, we will say, an axle forged, from which sixty pounds of metal are to be turned off. Do you suppose that the man at the lathe can get that sixty pounds off as quickly as the man at the next lathe will get fifteen pounds off from his axle ? Of course he can not. There is every difference in the world in the two cases. When you are going to get big work at the lathe, you want close margin, and then you can rush it through at fast feed. The first condition of quick work is to know how much is to be taken off your axle.

[*Remainder of proceedings will appear in our next issue.*]

The Master Car-Builders' Convention.

In view of the complications and embarrassments in which so many railroads are involved, and the consequent reduction of expenditures and working force, it was hardly to be expected that the attendance at the Convention would be equal to that of more prosperous years. It will be seen, however, that there has been no falling off as compared with the number in attendance last year at Cincinnati. Most of the leading roads, as well as several of the car manufacturing establishments, were represented ; and the spirit which marked the proceedings was such as to show an undiminished interest in the aims and purposes of the Association. So far as our own observation enables us to judge, a more harmonious, profitable, and satisfactory meeting has not been held since its organization. With one or two exceptions, the reports of committees were in readiness when called for, and all of them evince a commendable degree of industry and care in their preparation. The discussions upon the various topics presented, although to

some extent informal and conversational in their tone, were productive of much mutual benefit to the members present. We regret we are unable to publish the entire proceedings in our present number, but their great length compels us to defer the closing portion of them until our next issue.

If the objection should be raised that no final action was taken and no definite conclusions arrived at, it should be borne in mind that the mechanical problems involved in railway operation are many of them of such a nature as to render any immediate or final solution impracticable without far better facilities than are now provided for obtaining accurate data and estimating comparative results. The great obstacle is the lack of information in the form of statistics pertaining to rolling-stock service, the quality of material, cost of repairs, and the innumerable and apparently trifling causes of wear and waste, which in aggregate are such an enormous tax upon the resources of the roads. We need only refer, as an illustration, to the statement made by the committee on Draw-Bars and Buffers, in regard to the loss of coupling links and pins. The estimate almost surpasses belief, yet there can be little doubt that it is approximately correct. A stoppage of this one item of waste would, in these pinching times, be a great help to the roads; and it certainly ought to be within the ability of the Car-Builder's Association to accomplish it, even if it should involve the necessity of buying a patent-right. The same may be said in regard to the waste of oil. On some roads the rails and ties are kept almost as well lubricated as the car-journals. Two or three drops of oil per mile from one axle-box, multiplied into the whole number of axle-boxes on a leading line with a heavy traffic, would make an item of expenditure larger than most people suppose. These, and other causes of waste of a like nature, present strong claims upon the attention of practical railroad mechanics, and we are glad to see that the Association is alive to the necessity of doing something to remedy these evils.

The Committee on Car-Ventilation presented a long report, which, together with the report of equal length made by the same committee last year, is quite a voluminous contribution to the literature of ventilation. Enough has been said, we think, to show the *necessity* of car-ventilation; what is really wanted is the *thing itself*. People who suffer from breathing the foul atmosphere of closed and crowded cars, care little about a scientific chemical analysis of the air they breathe at such times, or the exact cubic quantity of fresh air per minute necessary for health and comfort. They are, as a rule, quite unconcerned as to whether the carbonic acid gas goes up or down, or is diffused equally through the car. What they require above all things is to be made comfortable by having some plan put in operation for that purpose, although it may not be in all respects what is desired. Partial relief is better than none; and this should not be withheld until inventors, theorists, and scientific experts are able to agree among themselves about all the technical and collateral points involved. The committee was continued another year, when it is to be hoped some definite plan will be presented which can be applied practically for the relief of railway travelers.

It will be seen by the report of the committee in charge of the "Dictionary of Terms," that this long-delayed work will be issued in the course of the present summer or early in the fall. Many difficulties have arisen in its progress which were not foreseen at first, and which have caused an unavoidable delay. We think there is nothing now to prevent its publication in a very few weeks.

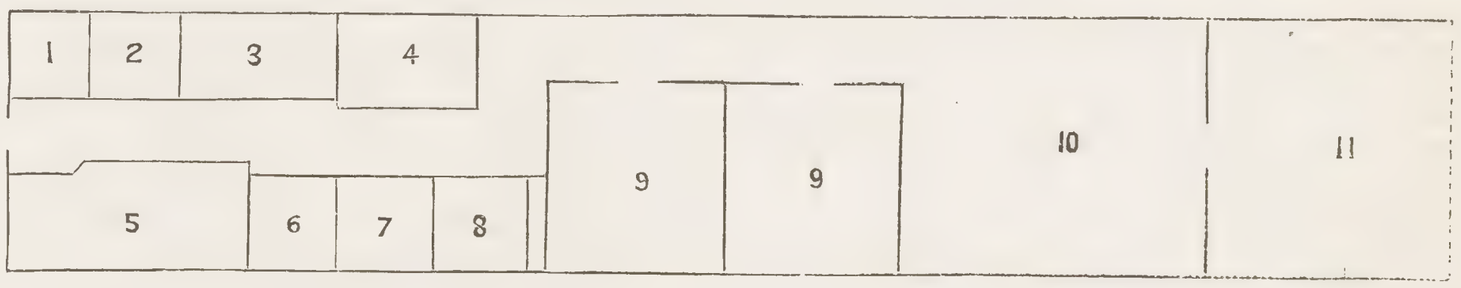
Reports were also made upon the treatment of hot journals; the size and framing of passenger and freight-cars; the best and most economical truck for freight-cars; and also upon car-brakes. Among the supplementary papers, was a report of tests made at the Stevens Institute, of models of the side-framing of freight-cars. A resolution was adopted, without a dissenting voice, thanking the parties who have hitherto contributed to the entertainment of the members of the Association upon the occasion of their annual meetings, and requesting that in future no more money be expended in getting up such entertainments. It was also decided that the next annual meeting be held in New-York, as being more convenient for members who may wish to visit the Centennial Exhibition, and at the same time avoid the inconvenience of procuring hotel accommodations for the Association, as a body, in Philadelphia.

A series of entertainments provided under the auspices of a large number of merchants and manufacturers of New-York and neighboring cities, were tendered to the members of the Association during their stay, including a carriage ride to Jerome Park races, a musical entertainment at the Hippodrome, a steamboat excursion on the bay and river, and a visit to the Stevens Institute of Technology, at Hoboken, where the party met with an exceedingly agreeable reception. The favorable weather contributed very much to the pleasure of these excursions, which were thoroughly enjoyed by all the participants.

A New Director's Coach.

A VERY fine specimen of car-construction has recently been turned out at the Hannibal shops, of the Hannibal and St. Joseph Railroad. It is a special coach intended for the use of the managing director of the road, B. F. Carver, Esq., and in design and workmanship is worthy of the particular description furnished us by a Western car-builder and correspondent, as follows:

The coach-body is 55 feet long and 10 feet wide.



The arrangement of the interior is shown in the diagram, and is such as to require the same end always to be forward in running, like the bow of a vessel. The forward end opens upon a passage-way as shown. In the left-hand corner is a Baker heater (1), inclosed in a tasteful wicker screen. Next to this (2) is the gentlemen's closet. The gentlemen's toilet-room (3) comes next, occupying a space of the same length as an ordinary section of a Pullman coach, but not as wide. Overhead is the porter's bunk, and there is also an electric bell with wires extending into the other apartments of the car; (4) is a regular Pullman section, with seats below and berths above, the berths having unique and highly ornamental head designs, capped with monogram initials, B. F. C. On the opposite side of the passage-way and next the door, are the kitchen and pantry (5) combined in one room, and containing a Wilks range, sink, and all the utensils and appurtenances of a complete culinary department. The space occupied is 4½ x 9 feet, and so well utilized as to furnish ample room for a well developed colored cook to ply the implements of his profession. Overhead is a reservoir of water for immediate use, and there is also another underneath the car with capacity for 200 gallons, and divided into longitudinal sections to prevent splashing. The kitchen and wash-stands are supplied by means of pumps, and there are also air-pipes for keeping the water pure. Next to the kitchen (6) is the wine and china closet, containing an ice-chest and case for silver-ware, the latter constructed from a special design, which can not be duplicated except by permission. Adjoining this is the linen-closet (7), supplied with a complete assortment of table and toilet linen, also 74 sheets, and 150 pillow-slips of superior quality, all marked with monogram as above; (8) is the ladies' closet; and the narrow space adjoining is used for stowing the mattresses belonging to the state-rooms (9) (9). These rooms are each 6 ft. 8 in. by 7 ft. 4 in. Each has two seats facing each other, a marble wash-stand and small wardrobe in opposite corners, and a portable table for taking meals. Sliding-doors close the openings to the passage-way, and light is admitted by a 38 x 42 plate-glass window in each.

The parlor or grand saloon (10) is 12 feet in length, and the full width of the car, with two windows, 38 x 42, on each side. On three sides of the room are spacious mirrors; the floor is carpeted with the best Wilton to be found in the market, and only a grade better than that in other parts of the car. The furniture is all of special pattern, and extremely rich and appropriate. There are no slat-blinds to the windows; but in their stead an outside roller curtain, and fine lace curtains with elegant plated brackets. The interior finish of the entire car is in walnut, with French burl paneling, and elegant carved designs distributed at proper intervals. The head-linings are well executed, and harmonize with their surroundings. There are six centre-chandeliers—two in the parlor, one in each state-room, and two in the passage-way; also four movable bracket-lamps, all of elegant and tasteful designs. The reflectors on the former are set low, so as to reflect all the light and throw it where it is most needed. They were designed by Mr. MacKenzie, the superintendent of machinery, and are reflectors in reality, as well as in name.

The rear of the car (11) is a marked innovation upon ordinary construction, and resembles a balcony, the end being entirely open, and also that portion of the sides between the window-rail and the plates. The roof is supported at the corners by turned pillars. This part of the car is 9 feet in length exclusive of platform, and affords an unobstructed view of the track and the surrounding country. The strength of the body-framing is not weakened by this arrangement, as the reduced weight makes the bracing below the window-rail sufficient to prevent sagging. Ventilation is provided for by admitting the air through a wire-cloth screen at the front end, where it passes into the car by a swinging sash. The side ventilators in the raised roof are also swinging sashes with wire screens on the outside. Miller platforms and couplers are used. The rear platform is inclosed by gates, so as to form an extension of the balcony. The car is mounted on six-wheeled trucks, with wheel-base of 11 feet between centres of outside axles. The journals are the M. C. B. standard. The boxes and brasses are peculiar to this road. The key-plate has a centre pivot, and fits the brass the whole length and width, allowing oscillation every way. The springs are a trifle heavier on the forward truck than on the rear one. Dinsmore spirals are used on the equalizers, and the speed is regulated by the Westinghouse air-brake. The outside of the car is painted wine-color and on the sides are oval panels inscribed with the name "Carver."

The Hannibal shops are under the superintendence of Mr. John MacKenzie, and this car has been constructed under his immediate supervision. It was ready for the track early last month, and is a credit both to the builder and the enterprise of the company. Some first-class work was turned out by these shops last year, including two magnificent parlor-coaches.

THE great length of the Convention proceedings has compelled us to leave out of our present issue the directory of master mechanics, car-builders, superintendents, and purchasing agents.

NEEDHAM'S
Safety Signal Light,
FOR
PREVENTING REAR COLLISIONS.

Shows in both directions whether the train is moving fast, or slow, or stopped.

In cases of trains uncoupling it is superior to the *"Block System,"* and for safety to trains following, it is the *Best Light in Use,* indicating by the simplest mechanism, both speed and distance.

CARS EQUIPPED FOR TRIAL FREE.

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No. 81 Hicks St., W. S.,

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W. LOUGHRIDGE'S AIR BRAKE,

Adopted by and about three years in use on the Baltimore and Ohio Railroad and connecting lines, the Western Maryland, and others, nearly 2500 miles.

The cost to equip and maintain this brake is about fifty per cent less, and its general effectiveness for stopping quickly for emergencies and general purposes is much greater than any other device of its class now claiming railway patronage. Rights for sale at a very low royalty per mile of road, thus enabling all companies to equip their trains and make repairs at their own shops.

Box 477, Baltimore, Md.

WANTED,

By the advertiser, a situation as a Mechanical Draughtsman, or Foremanship, to take charge of a Machine Shop, or both. Locomotive or Stationary Engine Shop preferred. Well experienced in all kinds of machinery, having passed through the shops as a mechanic of twelve years' experience. Good reference can be had from last employer as to character and ability. Apply to C. Percival, 39 and 40 Museum Building, Troy, N. Y.

RICHARD DUDGEON,

No. 24 Columbia Street, New-York,



Maker and Patentee of

Hydraulic Jacks and Punches,

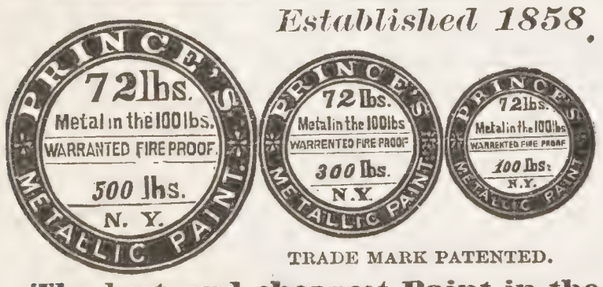
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Jacks for pressing on Car-Wheels or Crank Pins made to order.

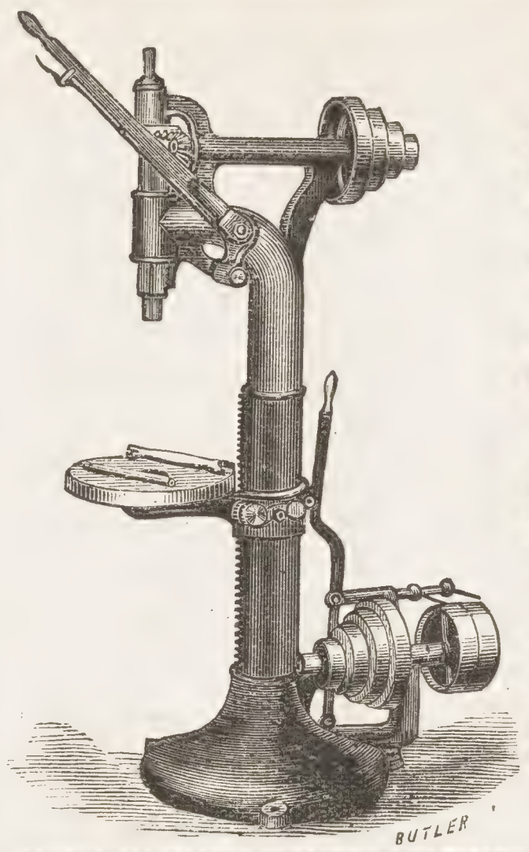
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The best and cheapest Paint in the world for Iron, Tin or Wood. For sale by the Trade everywhere. PRINCE'S METALLIC PAINT CO., Manufacturers, 96 Cedar St., New York.

CAUTION.—Purchasers and consumers are cautioned against imitations of our METALLIC PAINT. All genuine *PRINCE'S METALLIC PAINT* will bear our name and trade mark on each and every package. Send for a circular.

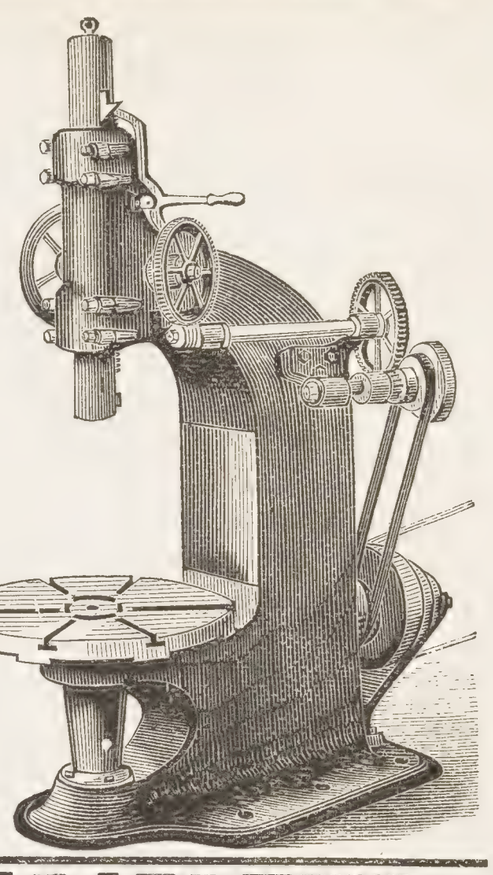


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Manufacturer of **ENGINE LATHES,** from twelve (12 to forty-eight (48) inches swing; **Hand Lathes; Wood Turning Lathes; Vertical Drills; Boring Mills; Tapping and Centring Machines; Screw Press** for Mandrels; **Grindstone Boxes.**

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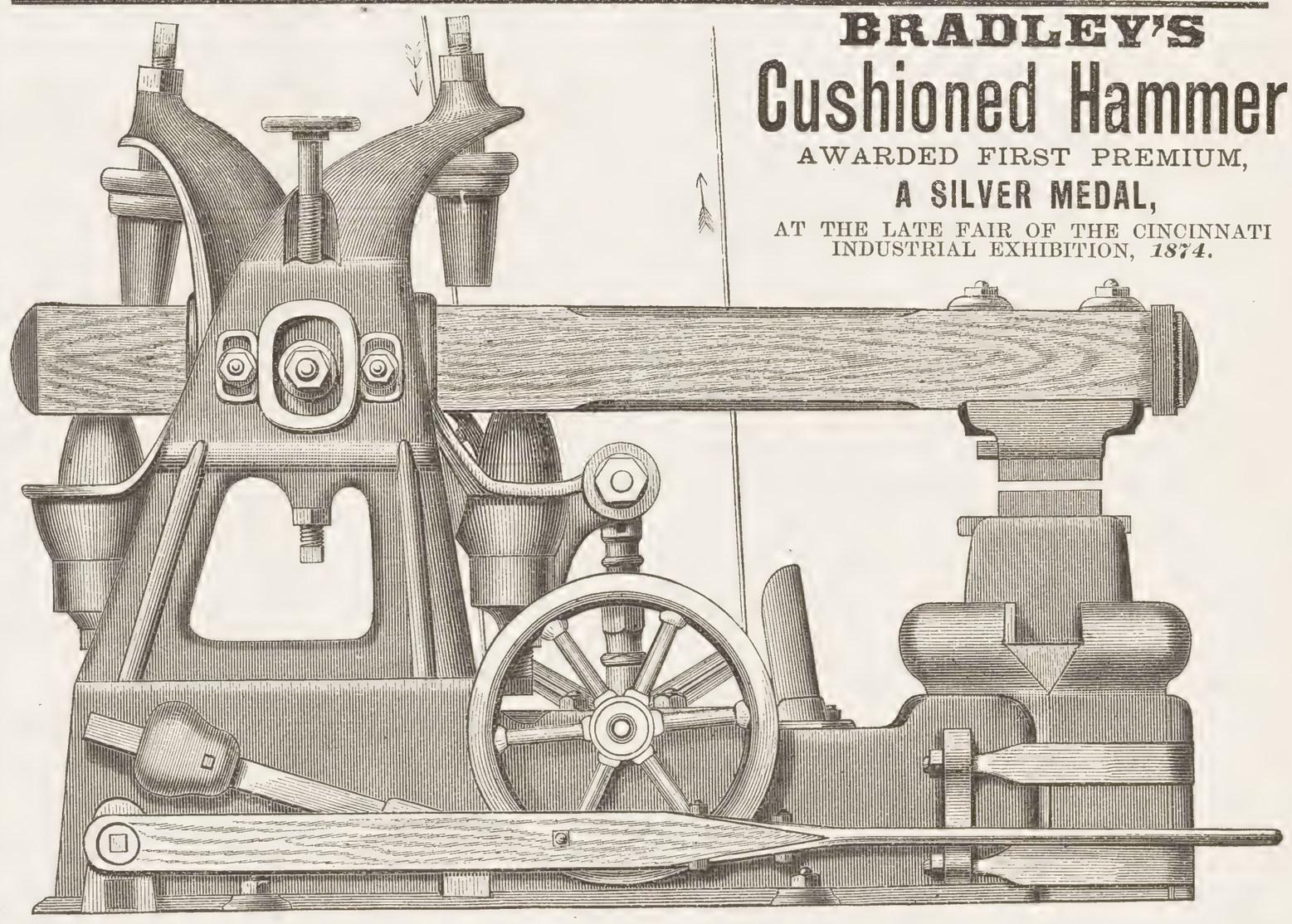


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Cushioned Hammer

AWARDED FIRST PREMIUM,

A SILVER MEDAL,

AT THE LATE FAIR OF THE CINCINNATI INDUSTRIAL EXHIBITION, *1874.*



This Hammer has many valuable improvements made useful in the device for cushioning the blow, thereby relieving all the working parts from that jar and concussion which is the destroying element of other helve hammers. It is made

Adjustable in Line of Action, Length of Stroke Rapidity of Motion, and Weight of Blow,

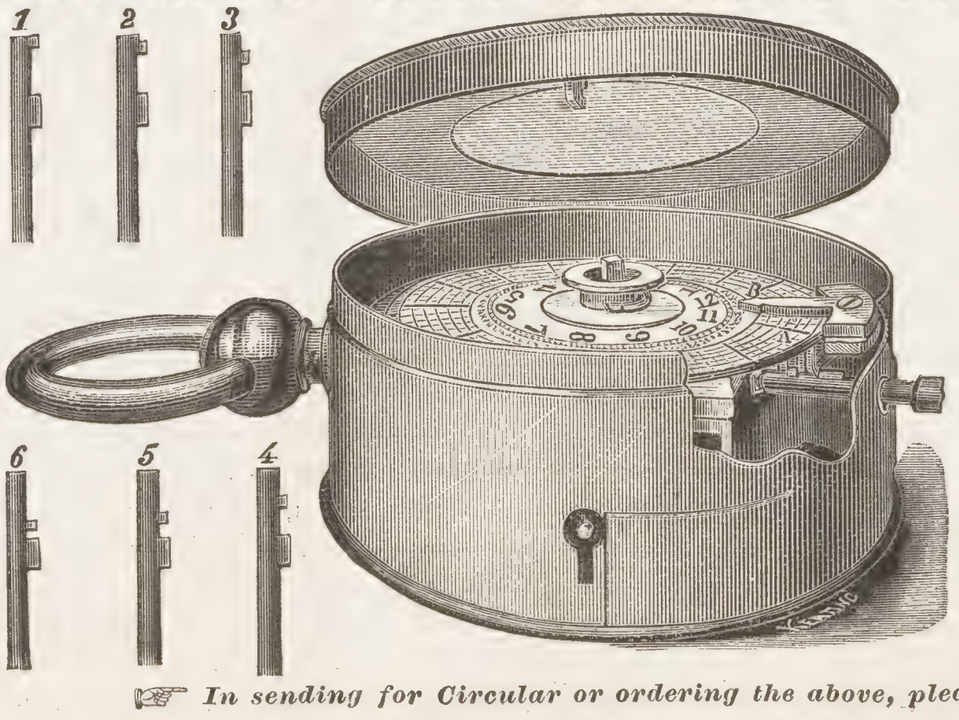
all of which are controlled at the will of the operator. They have

Larger capacity, cost less, are more durable, take up less room, do more and better work at less expense for power than any other Hammer in use.

We guarantee them fully as recommended. For particulars, address

BRADLEY MANUFACTURING CO., Syracuse, N. Y.

BUERK'S WATCHMAN'S TIME DETECTOR.



Important for all large corporations and manufacturing concerns; capable of controlling, with the utmost accuracy, the motions of a watchman, as the same reaches different stations of his beat. Send for Circular.

J. E. BUERK,

P. O. BOX 979,

84 Washington St., Boston, Mass.

N. B.—The public are notified that in my suit against *Imhaeuser & Co.*, of New-York, a decree was made in my favor, June 10, 1874.

Proceedings have been commenced against said *Imhaeuser & Co.* for selling clocks contrary to the order of the Court, and especially the clock with a series of springs in the cover and marked, "Patented October 20, 1874."

All persons discovered using these infringing clocks will be dealt with according to law.

In sending for Circular or ordering the above, please mention this paper.

Car Manufacturers.

Allison, W. C. & Sons	Philadelphia Pa.
Allegheny Car & Transportation Co	Swissvale, Pa.
Altoona Manufacturing Co	Altoona, Pa.
Adrian Car Co	Adrian, Mich.
Arlington Car Manufacturing Co.	Arlington, Vt.
Barney & Smith Manufacturing Co	Dayton, Ohio.
Baker, Jackson & Co	Latrobe, Pa.
Bellefonte Car Manufacturing Co.	Bellefonte, Pa.
Billmeyer & Smalls	York, Pa.
Bradley, Osgood	Worcester, Mass.
Bridgeport Car-Works	Bridgeport, Pa.
Brill, J. G. & Co	Philadelphia, Pa.
Buffalo Car Co	Buffalo, N. Y.
Canada Car Co	Toronto, Canada.
Canda, F. E. & Co	Chicago, Ill.
Cape Fear Building Co	Abbottsburg, N. C.
Cartersville Car Co	Cartersville, Ga.
Central Car & Manufacturing Co	Jackson, Mich.
Clendenning, W. W	Montreal.
Cummings Car-Works	Jersey City, N. J.
Connellsville Machine and Car Co	Connellsville, Pa.
De Pere Iron-Works	De Pere, Wis.
Detroit Car-Works	Detroit, Mich.
Dawson Manufacturing Co	Dawson, Ga.
Dickey, Neill & Co	Toronto.
Dickson Manufacturing Co	Scranton, Pa.
Erie Car-Works	Erie, Pa.
Elmira Car-Works	Elmira, N. Y.
Frederick & Co	Catasauqua, Pa.
Freas Brothers & Thornton	Berwick, Pa.
Gardner, F. & Co	Carlisle, Pa.
Gill, John L	Columbus, Ohio.
Gilbert, Bush & Co	Troy, N. Y.
Goold, James & Co	Albany, N. Y.
Goodrich Car Co	Augusta, Ga.
Hannibal Car Works	Hannibal, Mo.
Harris, J. & Co	St. John, N. B.
Harrisburg Car Manufacturing Co	Harrisburg, Pa.
Haskell & Barker Car Co	Michigan City, Ind.
Heathcote, Herbst & Co	Glen Rock, Pa.
Hamilton, William & Son	Toronto.
Harlan & Hollingsworth Co	Wilmington, Del.
Herrick Car-Works	Oswego, N. Y.
Huntingdon Car-Works	Huntingdon, Pa.
Indiana Car Co	Cambridge City, Ind.
Jackson & Sharp Co	Wilmington, Del.
Jackson & Woodin Manufacturing Co	Berwick, Pa.
Jones, J. M. & Co	West-Troy, N. Y.
Kimball Manufacturing Co	San Francisco, Cal.
Keith, H. T. & I. N	W. Sandwich, Mass.
Laporte Car Manufacturing Co	Laporte, Ind.
Lombard, Thomas	Augusta, Me.
Lebanon Manufacturing Co	Lebanon, Pa.
Lehigh Car Manufacturing Co	Stemton, Pa.
Litchfield Car Manufacturing Co	Litchfield, Ill.
Mansfield Machine-Works	Mansfield, Ohio.
Michigan Car Co	Detroit, Mich.
McNairy, Claflen & Co	Cleveland, Ohio.
Murray, Dougall & Co	Milton, Pa.
McVay, Walker & Co	Braddock's Field, Pa.
Mowry Car and Wheel Works	Cincinnati, O.
Middletown Car & Manufacturing Co	Middletown, Pa.
Missouri Car and Foundry Co	St. Louis, Mo.
Myers, H. S. & Co. (small cars)	York, Pa.
National Car Co	St. Albans, Vt.
New-Haven Car Co	New-Haven, Ct.
Niblo, James M	Conshohocken. Pa.
Ohio Falls Car Co	Jeffersonville, Ind
Ontario Car Co	London, Ont.
Oxford Co-operative Car Co	Oxford, Pa.
Patten Car-Works	Bath, Maine.
Peabody & Crangle Bro's	Calais, Me.
Peters, Simon	Quebec.
Petersburg Car Co	Petersburg, Va.
Pittsburg Car-Works	Pittsburg, Pa.
Pittsburg and McKeesport Car Co	McKeesport, Pa.
Pittsburg Car and Locomotive Co	Pittsburg, Pa.
Portland Co	Portland, Me.
Pullman Car Co	Chicago and Detroit.
Peregoy, J. H	Houston, Texas.
Ranlet Car Manufacturing Co	Laconia, N. H.
Russell & Co	Massillon, Ohio.
Sands, William L	Pottstown, Pa.
Schall, Michael	York, Pa.
Schenectady Car-Works	Schenectady, N. Y.
Shaaber & Johnston	Reading, Pa.
South-Western Car Co	Jeffersonville, Ind.
Shoenberger & Bryant	Duluth, Minn.
Seath & Hager	Terre Haute, Ind.
St. Charles Manufacturing Co	St. Charles, Mo.
Stephenson, John & Co	New-York, N. Y.
Star Mining & Manufacturing Co	Henderson, Ky.
Taunton Car Co	Taunton, Mass
Tredegar Co	Richmond. Va.
Watsontown Car Co	Watsontown, Pa.
Wharton, Thomas J	Brunswick, Ga.
Wason Manufacturing Co	Springfield, Mass
Weimer, P. L. & Bros	Lebanon, Pa.
Wyoming Valley Manufacturing Co	Wilkesbarre, Pa.
Wells, French & Co	Chicago, Ill.
Wilmington Car-Works	Wilmington, Del.

Car-Wheel Manufacturers.

Albany Car-Wheel Works	Albany, N. Y.
American Paper Car-Wheel Co	Hudson, N. Y.
Atlantic Iron-Works	Portsmouth, Va.
Baltimore Car-Wheel Foundry Co	Baltimore, Md.
Barnum Richardson Manufacturing Co	Chicago, Ill.
Barnum Richardson Co	Lime Rock, Conn.
Barney & Smith Manufacturing Co.	Dayton, Ohio.
Bass & Hanna	Fort Wayne, Ind.
Blanchard & Arnold	Milwaukee, Wis.
Boston Car-Wheel Co	Camb'gep't, Mass.
Bowler, Mayer & Brayton	Cleveland, Ohio.
Cayuta Wheel & Foundry Co.,	Waverly, N. Y.
Chicago Car-Wheel Co	Chicago, Ill.
Davenport, Fairbairn & Co	Erie, Pa.
Dawson Manufacturing Co	Dawson, Ga.
Detroit Car-Wheel Works	Detroit, Mich.
Ensign Manufacturing Co	Huntingdon, W. Va.
Fulton Foundry Co	Cleveland, Ohio.
Gill, John L. Jr	Allegheny City, Pa.
Green's Car-Wheel Manufacturing Co	St. Louis, Mo.
Hamtramck Car-Wheel Works	Detroit, Mich.
Harris, J. & Co	St. John, N. B.
Harrisburg Car Manufacturing Co	Harrisburg, Pa.
Haskell & Barker Car Co	Michigan City, Ind.
Heartt, Jonas S. & Co	Troy, N. Y.
Jackson & Woodin	Berwick, Pa.
John L. Gill	Columbus, Ohio.
Lehigh Car-Wheel & Axle Works	Catasauqua, Pa.
Litchfield Car M'f'g Co	Litchfield, Ill.
Lobdell Car-Wheel Works	Wilmington, Del.
London Car-Wheel Co	London, Can.
Louisville Car-Wheel & Railway Supply Co	Louisville, Ky.
Middlebrook & Mack	Oswego, N. Y.
Missouri Car and Foundry Co	St. Louis, Mo.
Mowry Car and Wheel Works	Cincinnati, Ohio.
Nash, John & Co	Cincinnati, Ohio.
Ohio Falls Car Co	Jeffersonville, Ind.
Parker & Bailey	St. Paul, Minn.
Pettengill, Glass & Co	Cleveland, Ohio.
Ramapo Wheel & Foundry Co	Ramapo, N. Y.
Russell, B. F. & Co	Chicago, Ill.
Rutland Foundry & Machine Co	Rutland, Vt.
Sterling Car-Wheel Foundry	Columbus, Ohio.
Scoville, J. & N. C	Buffalo, N. Y.
St. Louis Car-Wheel Co	St. Louis, Mo.
Taylor Iron Works	High Bridge, N. J.
Thompson, Duglas	Bordentown, N. J.
Tredegar Company	Richmond, Va.
Toronto Car-Wheel Co	Toronto, Can.
Washburn, Hunts & Co	Jersey City, N. J.
Washburn Car-Wheel Manufacturing Co	Worcester, Mass.
Wason Manufacturing Co	Springfield, Mass.
Whitney A. & Sons	Philadelphia, Pa.
Woodbury & Company	E. Cambr'ge, Mass.
Wyoming Valley Manufacturing Co	Wilkesbarre, Pa.

Locomotive Builders.

Baldwin Locomotive Works	Philadelphia, Pa.
Brooks Locomotive Works	Dunkirk, N. Y.
Danforth & Cooke	Paterson, N. J
Dawson & Baily (light locomotives)	Connellsville, Pa
Dickson Manufacturing Co	Scranton, Pa.
Grant Locomotive Works	Paterson, N. J.
Hinckley Locomotive Works	Boston, Mass.
Manchester Locomotive Works	Manchester, N. H
Mason, William	Taunton, Mass.
McKay Iron and Locomotive Works	Jersey City, N J.
Portland Company	Portland, Me.
Porter, Bell & Co. (light locomotives)	Pittsburg, Pa.
Pittsburg Locomotive Works	Pittsburg, Pa.
Rogers Locomotive Works	Paterson, N. J.
Rhode Island Locomotive Works	Providence, R. I.
Schenectady Locomotive Works	Schenectady, N. Y
Taunton Locomotive Works	Taunton, Mass.

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Manufacturers of and Dealers in all kinds of

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Locomotive and Car Builders' Machinery a Specialty.

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Buffalo Steam Gauge & Lantern Co.

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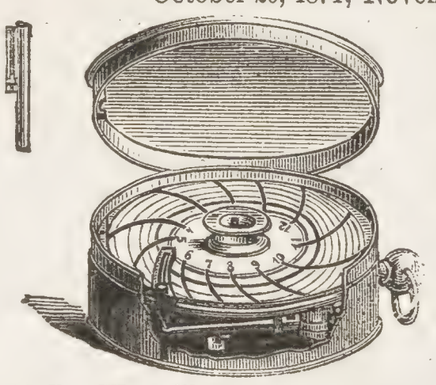
Manufactory and Office, corner Washington and Perry Streets,

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Reflectors Re-plated, Gauges of all kinds and Locomotive Balances Repaired at Short Notice.

WATCHMAN'S IMPROVED TIME DETECTORS.

U. S. Patents, December 28, 1869; April 22, 1873; August 2, 1874; October 20, 1874; November 10, 1874.



These Detectors are the latest and most complete invented. They are portable and reliable time-pieces and guaranteed in every case to be perfect. They can be cleaned and repaired by any watch-maker, and are invaluable and indispensable to all establishments that employ watchmen, as it enables them to check and control their movements. **Price,** with 12 keys (for 12 stations), **$75.**

N. B.—We will protect our customers against all claims of other patentees, and especially against J. E. Buerk, of Boston, Mass., who has never brought suit for any alleged infringement by clocks made under the above-named patents, and by us offered for sale. Send for Circular to

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212 Broadway, P. O. Box 4798, *NEW-YORK.*

PHELPS, DODGE & CO.,

Cliff St., between John and Fulton,

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Tin and Roofing Plates,

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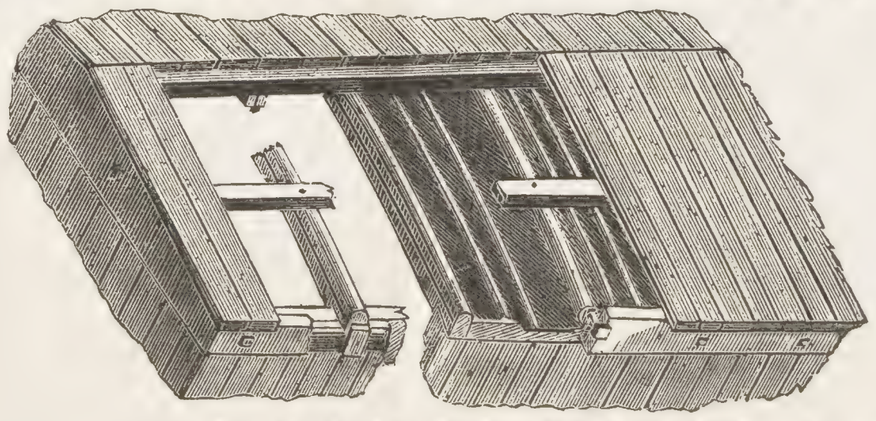
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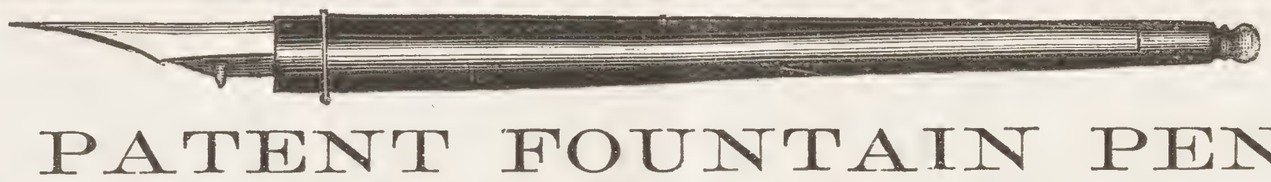
No. 39 Union Street,

CLEVELAND, OHIO.

Over 40,000 Cars now in service covered with this roof. It will last, without repairing, as long as the car it covers, and is more economical by one half than any roof in use.

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Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
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Tuckerton	J. Naramore		Tuckerton, N. J.
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Vermont & Mass. & Troy & G	O. T. Ruggles	O. T. Ruggles	Fitchburg, Mass.
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Wilmington & Reading	E. Collings	C. Stoltz	Coatesville, Pa.
Winona & St. Peter	S. Sanborn		Madison, Wis.
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HAWKES' PATENT FOUNTAIN PEN-HOLDER.

Fits any Pen. Rubber, $2, $2.50, $3.50, and $4.

GEO. F. HAWKES, 66 Nassau Street, New-York.

Noyes' Patent Liquid Cooler and Packing.

For Cooling Railroad Car and Steamboat Journals, and Bearings of all kinds, and for Mixing with other Oils.



The attention of those who are running heavy journals is respectfully invited to the above Liquid Cooler. It has been successfully used for upward of two years, and is constantly growing in favor, as its merits become known, and we are confident that practical men can not fail of being convinced that our preparation deserves their candid attention. What we claim for it is:

That it will Cool a Hot Journal when in Motion,

and extinguish the flame when the box is on fire; that its use will, in a great measure, prevent the occurrence of a hot journal, and save the expense, delays, and annoyances incident thereto; that it will eliminate the heat from a journal at a temperature greatly below the point required to melt the babbitt, preventing an accumulation of heat, and by a timely application save it from destruction; that its non-inflammable elements (where waste is used) permeate the waste and prevent its taking fire; that it keeps the journal smooth and polished, preventing unnecessary friction; that its combination is based upon true scientific principles, which renders it impossible to fail in its results, and is

The only Preparation that will Cool a Hot Journal

while it is in motion, as attested by certificates below; that one thorough application on a hot journal will do more execution in cooling than the constant application of water for half an hour, besides doing it evenly and without loss of time.

Every Railroad or Steamboat

should have a can of the Liquid Packing on board, with the directions for its use pasted upon it, and thus always have at hand the means of effectually cooling a hot journal, and thereby avoid the expense, danger, and trouble from this cause.

AN EXCELLENT AND DURABLE LUBRICATOR

can also be made by combining with the Liquid Cooler and Packing certain quantities of oil, according to the season of the year in which it is to be used, as set forth in the directions. The combination produces a soft, heavy body, that is very essential in hot weather. The Liquid also keeps oil sweet, by preventing oxidation, and its value is greatly enhanced by the additional body which it acquires; and, considering the increased durability, it will be found a matter of considerable economy to combine the Liquid and oil together.

This preparation will be found especially valuable for Steamships, and it has been a leading idea in its combination to especially adapt it for their use. There is, however, no class of machinery, where heavy bearings are used, where it can not be employed beneficially and economically.

On Railroads where Black oil is used as a lubricator exclusively, mixed as directed, especially in warm weather, it will be found a great improvement, and fully equal to lard oil, making a considerable percentage of saving in cost, lessening the liability of hot boxes; and animal oil can be entirely discarded, even in warm weather, and as good results obtained, with less expense, as where all animal oil is used.

The Liquid Cooler and Packing is put up in two forms, one for journals not using waste-packing, such as Steamships, etc., the other for journals on Railroad cars, etc. *In ordering, be particular to state which class of work it is required for.*

We manufacture suitable cans for using the Liquid Packing. Send for circulars containing full description and instruction for use.

WHAT RAILROAD MEN SAY OF IT.

Boston, Lowell and Nashua R.R. Superintendent's Office,
Boston, April 13, 1874.

P. Noyes, Agent:

Dear Sir: We have been using your Liquid Cooler and Packing, and consider it one of the best articles for cooling off hot boxes that we have ever been acquainted with. All of our trains are supplied with a can of it. John B. Winslow, *Supt.*

Person Noyes, Esq., East Cambridge, Mass., March 4, 1874.
Agent Belt and Leather Stuffing Co.:

Dear Sir: In reply to your inquiry in regard to Liquid Cooler and Packing, allow me to say:

I have just sent in a requisition for three barrels, which I trust you have received before this. I will only say in recommending it, that it is the best article I have ever used, and our conductors and engineers all indorse my sentiments.

I have ordered eighteen more cans, which I think will meet your approbation. I intend to have one on every train, and on long trains two, and have them made with inch nozzles, and a cap attached by chain, to prevent thickening; also a packing-iron about fourteen inches long, attached to a slot in the can, to be used in stirring up the Liquid, and also for drawing the waste out on the front side, and crowding it in on the back side, before putting the packing in. This little packing-iron I find very essential, as it is always at hand, and will prevent delay in searching for a suitable article in times of emergency. Yours truly,

JOHN F. CROCKETT, *M. M., Boston, Lowell, and Nashua R. R.*

Person Noyes, Esq., Chicago, Dec. 10, 1873.
Agent Belt and Leather Stuffing Co.:

Dear Sir: The barrel Liquid Packing sent on trial is approved, and you will please send us five barrels more. Yours, H. I. HIGGINS, *Purchasing Agent C., B., and Q. R. R.*

Chicago, March 23, 1874.

P. Noyes, Agent: Please forward to C., B., & Q. R. R., and send bill of same to this office, eight barrels of Liquid Packing and Cooler, same as purchased of you before, and send as soon as possible. H. I. HIGGINS, *Purchasing Agent.*

Agent Belt and Leather Stuffing Co.: Chicago, Ill., May 7, 1874.

Dear Sir: You will please forward to the C., B., and Q. R. R. ten barrels Liquid Packing.

H. I. HIGGINS, *Purchasing Agent C., B., and Q. R. R.*

Mr. Noyes: Fitchburg, Mass., Aug. 20, 1872.

Dear Sir: I have used your Liquid Packing for the past four months, and am perfectly well satisfied that it is the most effectual article ever in use for the purpose claimed. I have just ordered another barrel. If all railroad companies would adopt your Liquid Cooler, I think they would find a saving of nearly 20 per cent, when used with mineral or black oil, according to your directions. JACOB MARSH, *Master Car Builder, Troy and Greenfield R. R.*

Mr. P. Noyes: Salem, Mass., Aug. 7, 1872.

Dear Sir: I have been using your Liquid Packing for cooling car journals, for some time past, and have been well pleased with it. I have had occasion to use it a number of times under Pullman Cars, and it has been a complete remedy in every case of hot journals.

Every train should be provided with it, as it is a saving of time and expense in the running of trains, provided it is applied and cared for according to directions for using.

J. P. SOMERBY, *M. C. B. of Eastern Railroad.*

P. Noyes, Esq: Albany, Nov. 1, 1872.

Dear Sir: I received the barrel of Liquid Cooler and Packing you sent me for trial, and gave it out to our most experienced conductors, to use according to directions. Below please find their report:

"We, the undersigned, Freight Conductors on the Eastern Division of the N. Y. C. & H. R. R. R., have used the Liquid Cooler furnished by Mr. Jones, and find that when we arrive at a station with a hot journal, the Liquid Packing cools it sufficiently by the time we arrive at the next station to use the black oil, and then have no trouble in getting through with it. It is the best we ever used.—R. H. Fisher, A. W. Getmans, R. H. Heath, Wm. Hess, Conductors E. Div., N. Y. C. R. R. I. Ferguson, Conductor H. R. R. R."

JOSEPH JONES, *M. M., N. Y. C. & H. R. R. R., E. Div.*

CERTIFICATES OF NAVAL OFFICERS.

[COPY.]
Bureau of Steam Engineering,
Navy Department,
Washington, April 12.

Chief Engineer's Office,
U. S. Navy Yard, Washington, March 30, 1875.

Commodore Thos. H. Patterson,
U. S. N., Commandant:

Sir: In obedience to your order of December 24, 1874, to test the Liquid Cooler of Person Noyes, of Boston, Mass., and report upon the results, I respectfully submit the following:

This Liquid is a composition possessing both lubricating and cooling qualities, and when mixed with other oils, gives it more body and prevents oxidation.

The test was made upon a journal 9½ inches in diameter and 14 inches long, making seventy revolutions per minute. The journal was rough and in bad condition at the commencement of the test, and was allowed to become hot; the Liquid was applied and in a few minutes it was reduced to a good working condition. Several experiments were made, all with equally favorable results. The Liquid can be mixed with other oils, or, in extreme cases, with fresh or salt water, the latter being preferable, as it amalgamates more readily with the Liquid, which at the same time retains its lubricating qualities. It is very efficient for cooling hot journals, and the cost is about one half that of sperm oil.

The Castor Oil Belt Dressing is an excellent article for preserving belts. It protects the surface from the atmosphere, keeps them pliable, and makes them adhere closely to the pulley, and more durable. Very respectfully, your ob't serv't,

(Signed) EDWARD FITHIAN, *Chief Engineer, U. S. N.*

Person Noyes, Agent: Boston, April 15, 1875.

Dear Sir: I have been using your Liquid Cooler for some six months past, and can say of it that in all respects it is far superior to any thing of the kind I have ever used. After having tried many cooling mixtures, down even to cold water, upon one of our engine bearings, without success, your Cooler has worked a complete change, to our entire satisfaction. I also find that with one third of your Liquid and two thirds oil, it has the desired effect of keeping cool bearings and lubricating them perfectly at the same time. In some extreme cases it may be expedient to use more than one third of the Liquid. With what experience I have had, I find it the best article for all bearings, and use the same on all machinery in my department. Would cheerfully recommend it to all parties who have charge of machinery for economy and durability, and, both afloat and ashore, engineers will find it of great benefit to them.

I have also tried your Castor Oil Belt Dressing on my belts, and consider it the best article for softening and preserving the leather that I have ever used.

Yours, most truly,

THOS. J. MARSTON, *Navy Yard, Boston.*

P. Noyes,
Agent Belt and Leather Stuffing Co.: Boston, April 15, 1875.

Sir: I have had in use for some time past, your Liquid Cooler, and having given it a thorough trial, I can say that I regard it as being the best article for cooling a hot journal that I have ever used. I have tried it on thrust bearings, which is the worst place for heat that I have on board ship, and it cooled it down splendidly. I find by mixing one part of your Cooler with about two parts lard oil that my anxiety was lessened considerably, after having it in use forty-eight hours, regarding hot bearings. By attention to mixing and stirring, it will cool down the bearing. I save about one third by mixing Liquid Cooler with lard oil. I would recommend any one to try it, both for its economy and cooling properties.

Yours, very truly,

A. MORRISON, *Chief Engineer Steamship Carroll.*

Send for a Barrel. No charge unless it does all we state.

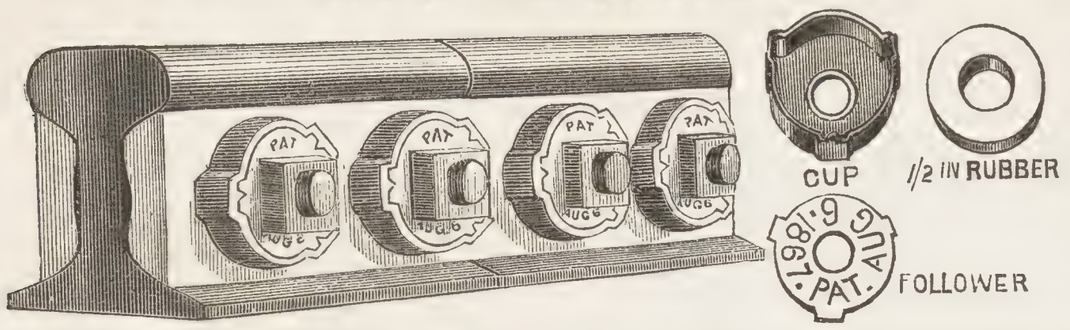
Manufactured by the Belt and Leather Stuffing Co.,

47 INDIA STREET, BOSTON.

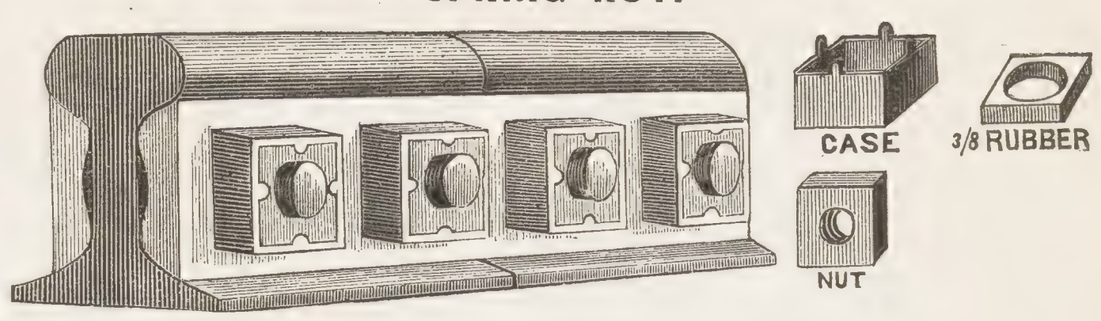
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PRATT'S PATENT COMPENSATING FISH-PLATE JOINTS.

"SPRING CUP-WASHER."



"SPRING NUT."



Track Bolts and Nuts are constantly subjected to a vibration and jar. One large item of expense is for wrench-work and replacement of bolts and nuts already off.

Most of the contrivances for removing this trouble are failures. They do not remove the cause of the trouble. This can only be done by some elastic material, which will absorb the vibration and prevent its reaching the nuts. Experience proves that permanent elasticity can not be obtained by using wood, which is perishable, or steel, which can not be made of uniform temper. In our inventions, the elastic packing of rubber between the nut and the plate absorbs the jar or vibration, insulates the nut, and by removing the cause of the trouble removes the trouble itself. Among its advantages are these:

1st. It saves the expense of wrench-work and loss of nuts.
2d. The rubber absorbs the blow given by the wheels at the joint, in such manner as to prevent fracture of rails at the joint, and accidents resulting therefrom.
3d. The track is made noiseless.
4th. Rails are saved from pounding out at the ends, and the thread of the bolts and nuts from stripping.
The practical value of these inventions is more fully demonstrated by the two million joints now long in use.

Manufactured and Sold by

THE PRATT MANUFACTURING COMPANY,

NO. 71 BROADWAY, NEW-YORK,

Manufacturers and Dealers in all kinds of RAILWAY TRACK SUPPLIES; also, New-York Agents for the Tuttle & Whittemore Co., Naugatuck Conn., Manufacturers of REFINED MALLEABLE IRON CASTINGS, from Patterns to order.

Special attention given to MALLEABLE IRON CASTINGS for Railroad Car construction.

VOSE, DINSMORE & CO.,

Manufacturers of

RAILWAY CAR SPRINGS

OF EVERY DESCRIPTION,

INCLUDING THE "COMBINATION ELLIPTIC SPRING."

Special attention is called to our Patent **CLIFF ELLIPTIC SPRINGS** for Freight and Passenger service. See advertisement, page ii.

Steel Rails, Locomotive and Car Tires, Elliptic Springs and Cast Steel of all descriptions.

JOHN C. WYMAN, General Manager.

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720 North Second Street, St. Louis.

32 Warren St.,
NEW-YORK.

Railroad and House Painters' Colors,

Made from the Very Best Materials and especially prepared for Painting Railroad Cars, Station-Houses or Depots, Bridges, etc., etc.

BUYERS WILL FIND IT GREATLY TO THEIR ADVANTAGE TO EXAMINE OUR PAINTS WHEN PURCHASING.

Sample Cards furnished upon application.

Manufactured by BAXTER, BELL & CO., 21 Park Place and 18 Murray St.,

NEW-YORK,

Manufacturers and Importers of White Lead, Zinc Paints, Oils, Varnishes, Glass, Putty, Whiting etc., Fine and Ordinary Colors, Dry and in Oil.

HOADLEY & PERKINS

Manufacturing Co.

COR. FRANKLIN AND CENTRE STS.

(New-Haven Railroad Freight Depot),

MANUFACTURERS OF

BRASS COCKS

For Steam, Water, and Gas.

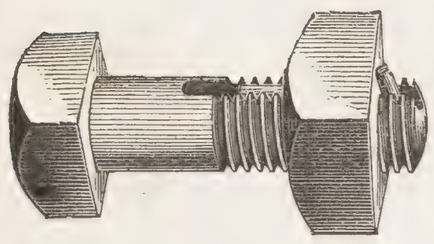
☞ *Illustrated Catalogue and Price-List furnished on application.*

Wm. Courtenay, President. Chas. F. Cobb, Secretary.

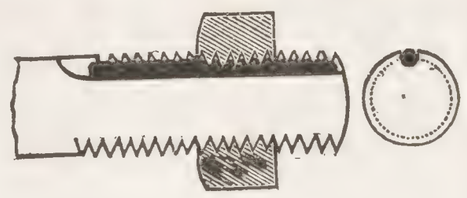
The Lock-Nut and Bolt Co., of New-York,

Office, No. 17 DEY STREET, New-York.

Manufacturers of all kinds of BOLTS, for FISH-PLATES, CARS, BRIDGES, MACHINERY, CARRIAGES, &c., with the



"Cumming Nut-lock,"
Patented
June 16, 1868,
August 23, 1870.



SECTIONS.

Unequaled for CHEAPNESS, SIMPLICITY & EFFECTIVENESS.

This simple device, as will be seen by the engravings, consists of a groove being cut in the threaded part of a screw bolt into which is placed a key of copper wire, or other soft metal; when the nut is screwed on, it cuts a thread on the key, thereby making it impossible for the key to get out until the nut is taken off. When the nut is screwed up to its place, that part of the key over which the nut has passed is riveted up against the nut with a small punch, destroying the thread on the key. The nut, therefore, can not move backward until force is used, as with a wrench.

The groove can be rapidly cut with a simple machine designed for the purpose.

Experience has proved this device absolutely reliable, and it is the cheapest of all known devices for the purpose. By its use, old bolts on which the nuts have become too slack for use can be made as good as new, making it a great saving to railroad companies and others in that item alone. It is cheaper than a check-nut.

If the bolt should become slack from shrinking of timber or other causes, *the nut will always remain firmly attached to the bolt*, and, with the wrench, can be screwed up *any distance*, and the wire riveted up any number of times, or can be taken off without injury to the nut or bolt.

This is the only method in use that locks the nut firmly to the bolt without regard to place or surroundings, all others require some attachment that holds the bolt in its position, and a washer or other attachment to keep the nut from turning.

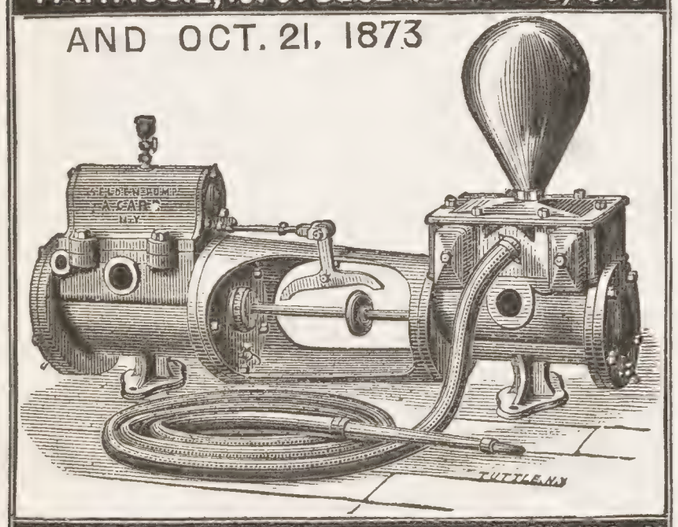
Directions for Use.—Place the copper key in the slot, pointed end out, and beveled side up, in such a position that when the nut is screwed to its place about three-eighths of an inch of the key will project beyond its outer face. Then screw the nut to its place *over the key*, allowing it to cut its own thread in the copper. Then take a narrow flat set punch, and rivet the projecting part of the key *solidly* against the outer face of the nut. To tighten the nut: screw it up, and rivet the key tighter. To remove the nut: simply apply the wrench and unscrew the nut. It will cut its own way out through the copper. The same key can be used several times, by moving it outward a few threads in the slot.

"DEAD STROKE" POWER HAMMER.

IMPROVED ADJUSTABLE CRANK PIN.
Strikes Blow Heavy or Light, Fast or Slow.
Prices Reduced Jan. 1st, 1875.
The Hull & Belden Company, Danbury, Ct.

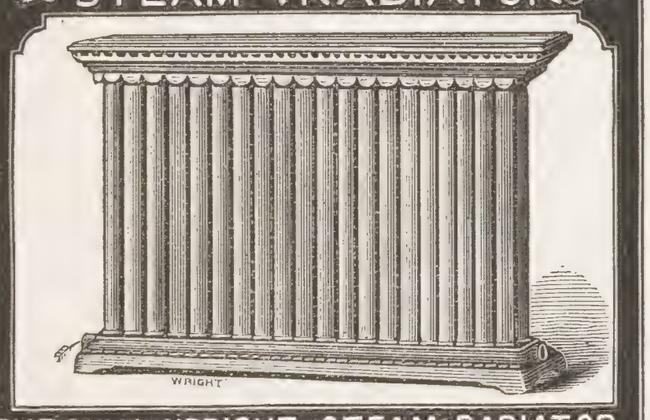
THE SELDEN DIRECT-ACTING STEAM-PUMP

PAT. AUG. 2, 1870. DECEMBER 20, 1870
AND OCT. 21, 1873



COMBINING SIMPLICITY AND DURABILITY TO A REMARKABLE DEGREE. ITS PARTS ARE EASY OF ACCESS AND IT IS ADAPTED TO ALL PURPOSES FOR WHICH STEAM PUMPS ARE USED

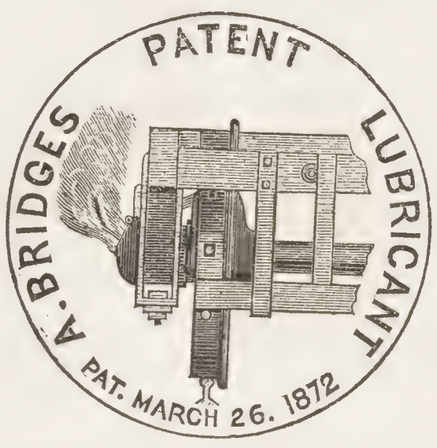
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MANUFACTURER AND PROPRIETOR,
43 CORTLANDT ST. NEW YORK.
CARR'S POSITIVE CIRCULATING
STEAM RADIATOR



THE ONLY UPRIGHT STEAM RADIATOR MADE WHICH HAS A POSITIVE CIRCULATION.
ALSO
WROUGHT IRON PIPE, BRASS AND CAST WORK & C.
FOR
PLUMBERS, STEAM AND GAS FITTERS.
SEND FOR DESCRIPTIVE CIRCULAR AND PRICE-LISTS

HOT JOURNALS ENTIRELY PREVENTED

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For Railroad Car Journals and other Bearings.

In presenting this Lubricant to the notice of Railroad and Steamboat Managers and Operators in Machinery generally, I do so with a practical knowledge of its merits, and with confidence that it will be found to possess invaluable qualities as a

Lubricator and Counteractor of Friction.

It has been in use, during the past two years, on a number of Railroads and Steamers, and is highly approved of.

Parties wishing to make a practical test of the Lubricant will be furnished with sample on application.

ALBERT BRIDGES, Patentee,

MANUFACTURER AND DEALER IN

RAILWAY SUPPLIES and MACHINERY,

No. 46 CORTLANDT STREET,

SEND FOR CIRCULAR. NEW-YORK.

HARRISBURG FOUNDRY

AND

Machine Company,

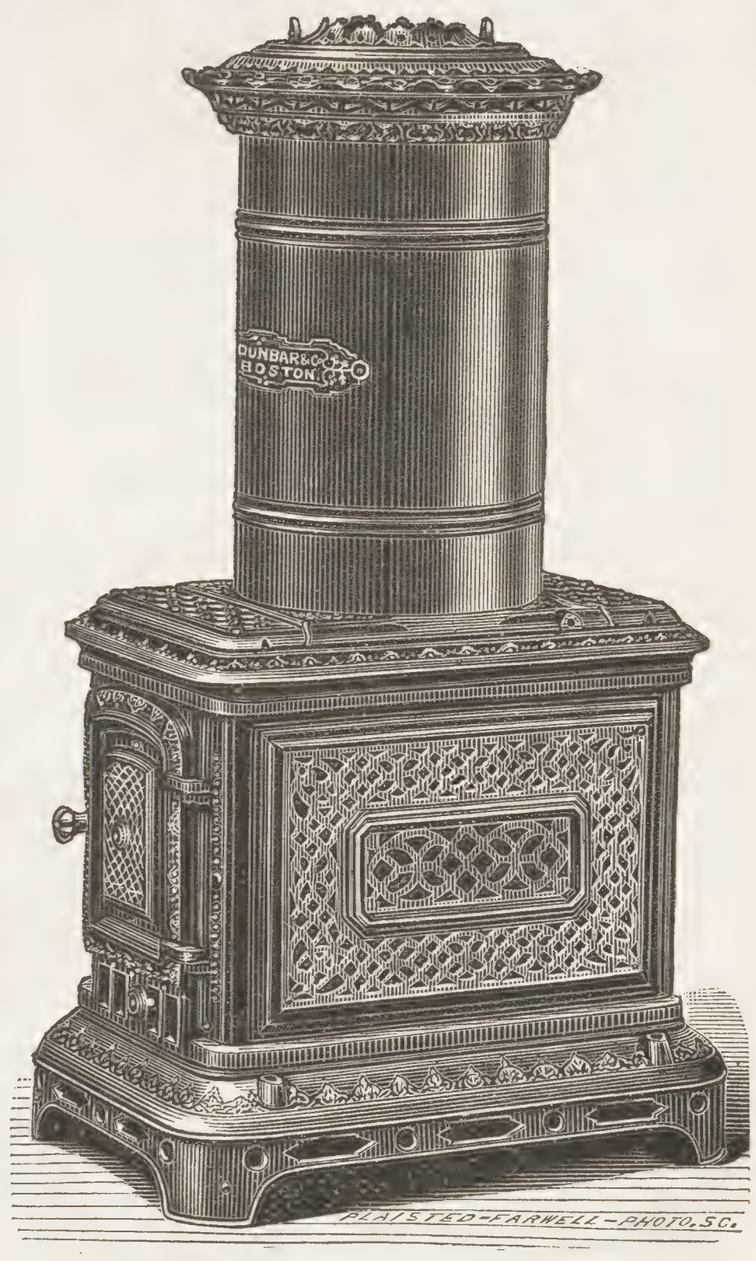
HARRISBURG, PA.

Manufacture all kinds of Machinists' and Car-Builders' Tools, for working Iron, such as Lathes, Planers, Slotting Machines, Horizontal Drilling and Boring Machines, Vertical Drills, all sizes, Shaping Machines, Bolt Cutters, Nut Tappers, Car Wheel Borers, Hydraulic Wheel Press, Axle Lathes, etc. Patent Sectional Tubular Boiler, safety and great economy at moderate cost.

Also Oil Tank Cars, Boiler and Sheet Iron work of all kinds, Foundry Cupolas, Cranes, Ladles, etc.

SAMUEL FISK, General Manager.

GEO. DUNBAR & CO.'S Railway-Car Stove.



The above cut represents our new Railway Wood-Burning Car Stove, which for Style and Economy is unsurpassed by any in the market.

GEO. DUNBAR & CO.

Dealers in

General Railroad Supplies,

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General Selling Agents for Boston Car-Spring Co. and Chrome Steel Co.

THE UNION WHITE LEAD MANUFACTURING CO.
COMPANY.
PURE

Union White Lead Manufacturing Co.,

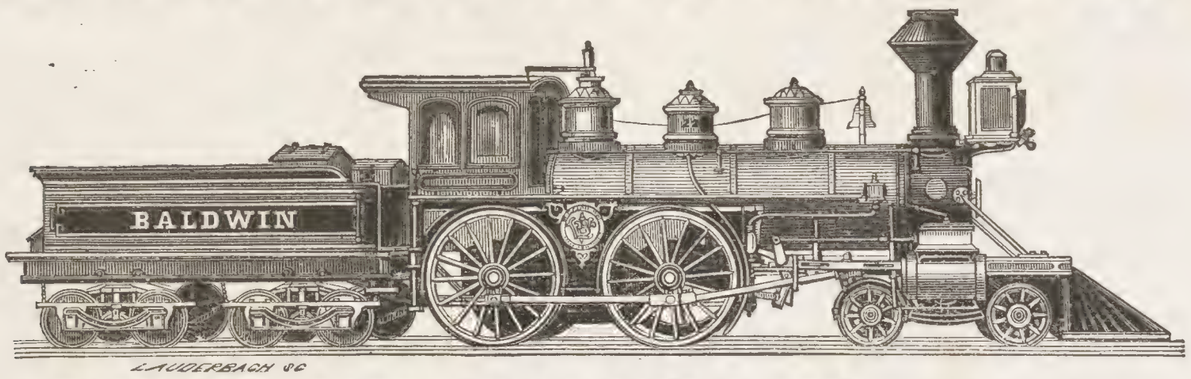
26 Burling Slip, New-York.

B. W. HOW, Secretary. JAMES HOW, President.

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BALDWIN LOCOMOTIVE WORKS.



LAUDERBACH &C

BURNHAM, PARRY, WILLIAMS & CO., Philadelphia,

MANUFACTURERS OF

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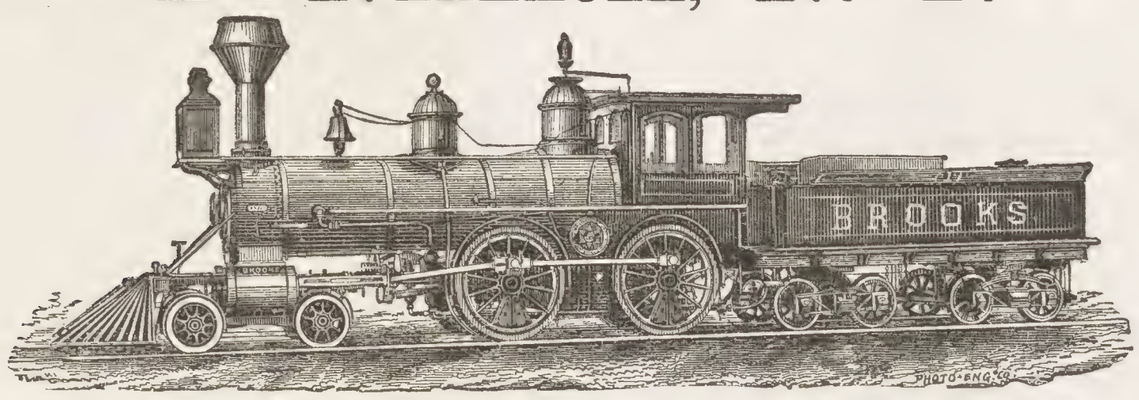
Especially adapted to every variety of Railroad use, including Mine Engines and Locomotives for Narrow-Gauge Railways.

☞ *All Work thoroughly interchangeable.* ☜

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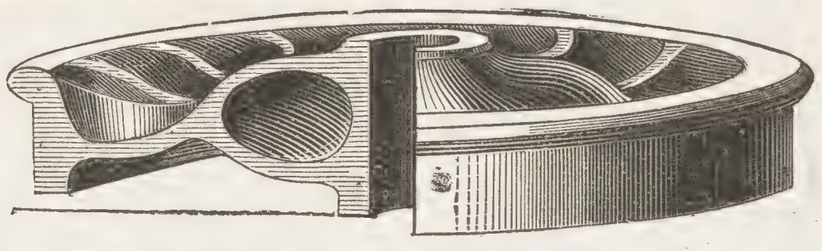
DUNKIRK, N. Y.

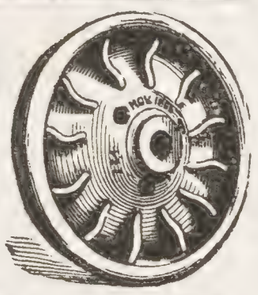


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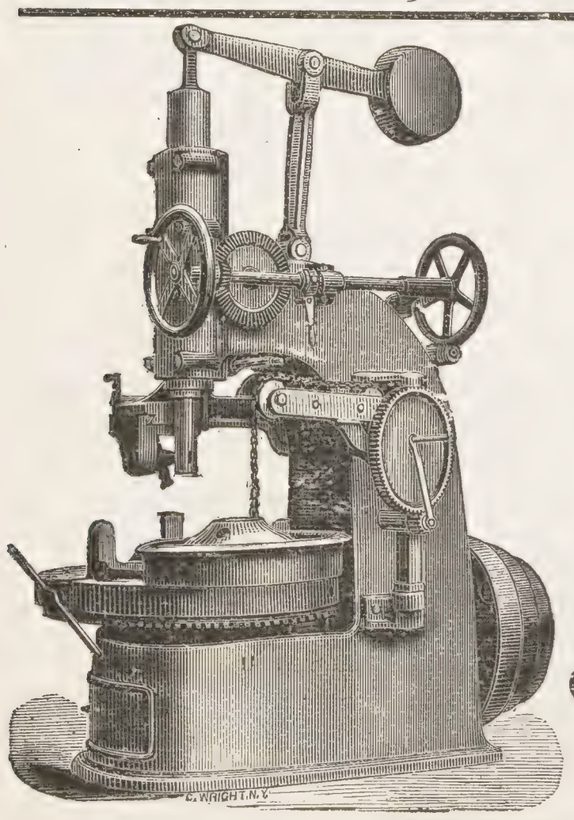
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Chilled Wheels for Drawing-Room and Sleeping Coaches,

LOCOMOTIVES, TENDERS, PASSENGER AND FREIGHT CARS.

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MANUFACTURERS OF

MACHINISTS' TOOLS

OF ALL DESCRIPTIONS

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WE HAVE THE BEST AND MOST COMPLETE ASSORTMENT OF

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WHICH ARE MADE ABSOLUTELY PERFECT WITH OUR

PATENT MOULDING MACHINE.

☞ FOR PHOTOGRAPHS, PRICES, AND DESCRIPTION, ADDRESS

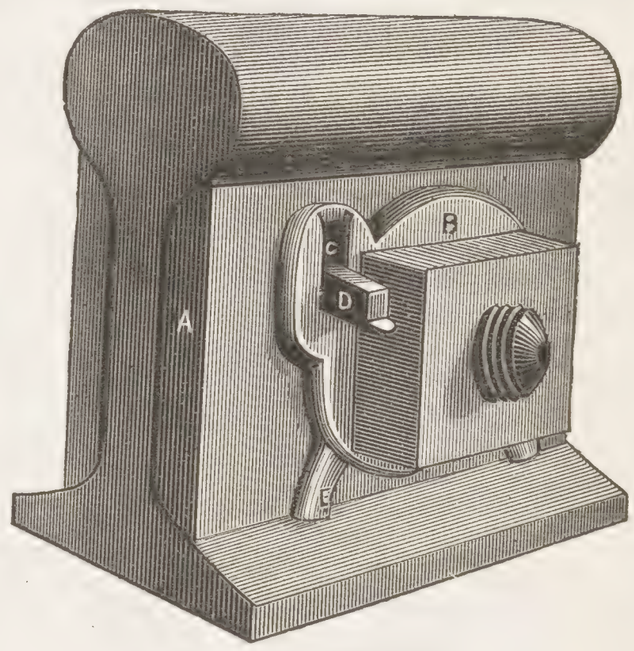
NEW-YORK STEAM ENGINE CO.,

98 CHAMBERS STREET, NEW-YORK.

PURDIE'S PATENT

Safety Washer,

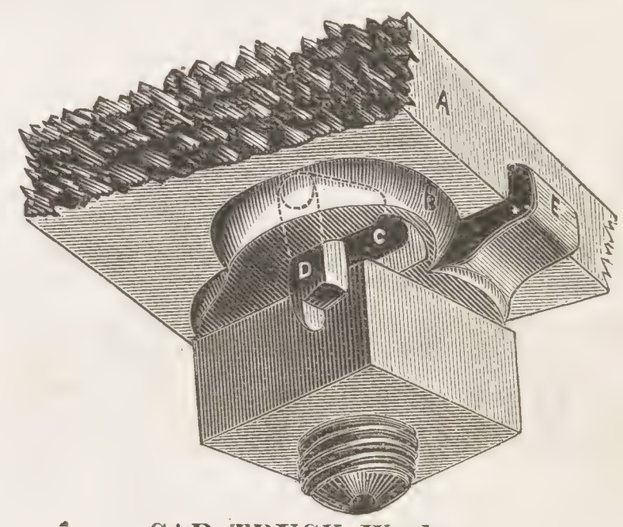
A Positive Nut-Lock, made of Malleable Iron.



For FISH PLATE.

EXPLANATION OF CUT.

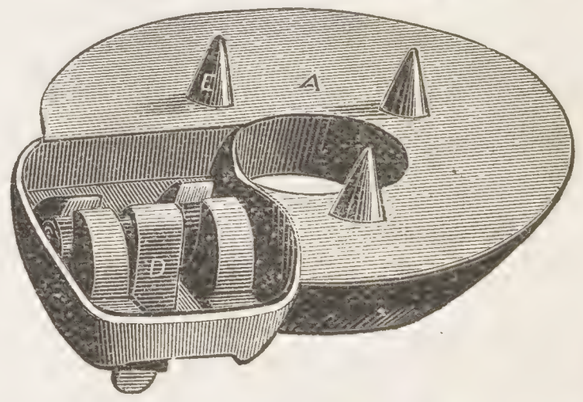
A, Fish plate. *B*, Washer, with projecting feet. *C*, Cavity, into which the dog, *D*, swings, on screwing up the nut. *D*, Pivoted dog which falls by side of nut when screwed home.



CAR TRUCK Washer.

Adapted for use on fish-plate bolts, car trucks, wagons, mowing machines, wood-work of all kinds, or for any purpose where bolts and nuts are used.

Cheap, Effective, and Durable.



Reverse side for WOOD-WORK, showing Method of Pivot Swing.

Will fit on old or new work, no alterations or special tools needed, requiring no rubber or wood for compressing or bending to hold the nut. The dog being in position to lock at any time required, by turning down by the side of the nut when screwed home; should the bolt or thread give any, so as to become loose, the dog will still hold the nut from turning back, and the nut can be screwed up as readily as by the old method.

Have been practically tested for two and a half years on many Railroads, giving unqualified satisfaction, one Railroad alone having them on over 2,500 cars.

Cast-iron washers for timber or bridges furnished to any size or weight.

Samples and price-lists forwarded on application to

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BUFFALO, N. Y.

J. F. SULLIVAN,
DESIGNER AND ENGRAVER ON WOOD
No. 23 JOHN ST. NEW YORK

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NICKEL-PLATED SCREWS.
ADAMS NICKEL-PLATING and MFG. CO.
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THE
PETERSBURG CAR COMPANY,
Petersburg, Va.,
Are now ready to receive orders for all kinds of
FREIGHT CARS.
These works are supplied with the most improved machinery, and have switch connections with broad and narrow gauge. They are prepared to furnish Rolling Stock with the utmost promptness, of the best materials and workmanship, and at the lowest prices.
T. L. H. YOUNG, President. JOHN W. FLEMING, Superintendent.

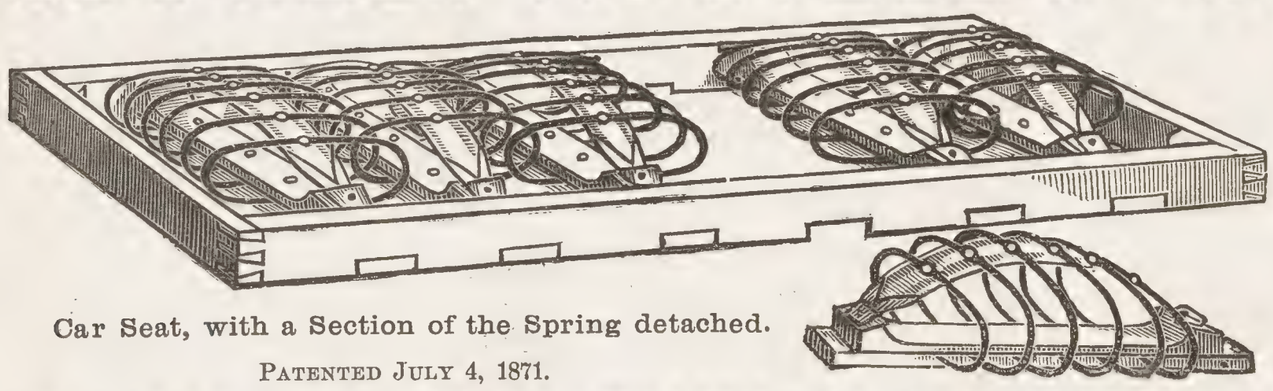
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Make a *Specialty of Freight Car Forgings* and *Castings* delivered to Shops. Also *Locomotive Cylinders, Frogs and Switches.* Address,
THOS. N. MILLER, President.

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UNIVERSAL WOOD WORKERS
TRADE MARK
WOOD WORKING MACHINERY.
BENTEL, MARGEDANT & CO.
HAMILTON, OHIO.
Send for Catalogue and Price List.

CRANK PLANERS.
Superior Design and Workmanship, Extra Heavy (1400 lb.)
DOWN, ANGULAR & CROSS-FEED,
TO PLANE 12x16x15.
The Hull & Belden Company, Danbury, Ct.

IRON AND STEEL
DROP FORGING.
Of Every Description, at Reasonable Prices.
The Hull & Belden Company, Danbury, Ct.

COBB'S ELLIPTIC STEEL SPRING.



Car Seat, with a Section of the Spring detached.

PATENTED JULY 4, 1871.

FOR CAR SEATS AND SPRING MATTRESSES FOR SLEEPING CARS.

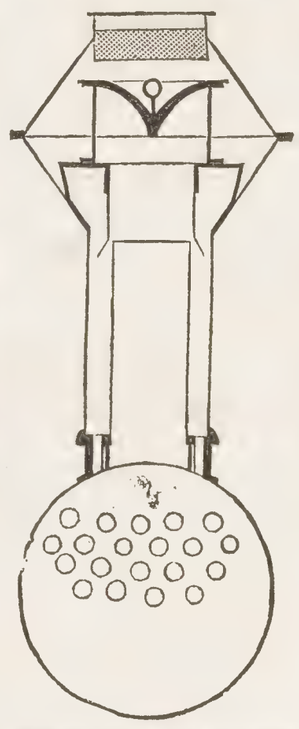
These Springs have been in successful operation on a large number of the leading railroads in the United States for over three years.

OFFICE OF PULLMAN PALACE CAR COMPANY,
CHICAGO, January 1, 1873.

Z. COBB & SONS, CHICAGO, ILL.:
GENTS: Have used your Patent Elliptic Steel Spring *exclusively* for the last three years in over **300** of our cars, and are satisfied of their superiority over all other springs in use.
A. B. PULLMAN.

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BRANCH OFFICE: Wilmington, Del.

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For Coal and Wood Burning Locomotives.

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We are now prepared to lay before the Railroad public a Smoke-Stack, which has been used for twelve months on the Memphis and Charleston Railroad, on Passenger, Freight, and Switching Engines, carrying the most combustible article—Cotton—without any danger of Fire whatever from sparks, or annoyance to passengers.

Railroad Companies wishing to use them can be furnished with working drawings by sending size of cylinder of engines to be used upon.

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ANTHONY ROSS,
Master Mechanic,
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CAR HEAD-LINING WORKS,
NEW-HAVEN, CONN.

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OF THE MOST APPROVED STYLES AND PATTERNS

Either Full Decorated, Part Decorated, Encaustic, or Printed and Plain,

At Short Notice and in the Most Satisfactory Manner.
Orders will be received at the Factory, in New-Haven, Ct., or by

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NILES TOOL WORKS,
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IRON PLANERS,
With Patent Improvements; noiseless in action, automatic in all their movements; run parallel with line shafts without bevel gearing.
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Which are unrivaled for their excellence. These Tools are as easily operated as a Lathe, and are warranted to do accurate work, with the greatest dispatch.
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With Universal Movements; will drill at any angle, and at any point within the reach of the Machine. Three sizes, from $700 to $2000 each.
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Of new design. Roll is not removed when taking out sheets. Great economy of time and labor is secured.
CAR-WHEEL AND AXLE MACHINERY,
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The "Eclipse" Fan-Blower,



For Blacksmiths, Coach-Makers, Machinists, Contractors, and all having use for Smith or Forge fires. Suited to any fire, right or left side; works easy, blast regular, and made at will for light or heavy work; only occupies 12×20 inches floor space; cheaper and better than bellows.
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THE ROCKY MOUNTAIN VERMILION PAINT

Is "Nature's Compound" of COPPER, MERCURY, LEAD, and IRON.

A PURE OXIDE OF METALS, CONTAINING NO EARTHY MATTER.

Hence we claim and are prepared to *prove* that it is the

Best and Cheapest Paint in the Market.

Properly mixed, we will guarantee it to Cover Double the Surface and wear twice as long as ordinary paints. It will not *Peel*, *Scale*, *Crack*, or BLISTER, though subjected to high degrees of heat. It will effectually prevent the corrosion of metals even in mid-ocean. Warranted *superior* to Red Lead, or any other lead, for any and all purposes for which Paint is required. We are fully aware that these statements will be more or less discredited by many, and although we might produce hundreds of testimonials corroborating our claims, even then doubts would exist; and as the most convincing proofs are obtained by actual test, we simply ask you to *TRY IT!* Submit it to any reasonable test you please, and you will soon find that we have not *overstated the facts*, and that *your interest*, and the interests of *all concerned*, will be subserved by the use of the

ROCKY MOUNTAIN VERMILION PAINT.

Furnished dry, in whole and half barrels containing 200 pounds and upward; also ground in pure linseed oil, in barrels or kegs; also in gallon packages, mixed ready for use.

ROCKY MOUNTAIN VERMILION PAINT CO. Trade Mark.

ALL ORDERS SHOULD BE ADDRESSED TO

WILLIAM H. COREY,

General Agent for the United States and Territories,

No. 20 SABIN STREET, PROVIDENCE, R. I.

CAUTION.

Owing to the great superiority of this Paint over all others, causing a constantly increasing demand, some unscrupulous parties are selling inferior articles of paint under the name of

ROCKY MOUNTAIN.

Be sure that each package bears the Trade-Mark of this Company, as herein shown, without which none is genuine.

LEHICTON PAINT AND LINSEED-OIL MILLS,

C. E. HECHT, Proprietor,

EASTON, PA.

Pure Raw and Boiled Linseed Oil, White Leads and Zincs, Colors, Putty, Varnishes, Japans, etc.

SOLE MANUFACTURERS OF THE

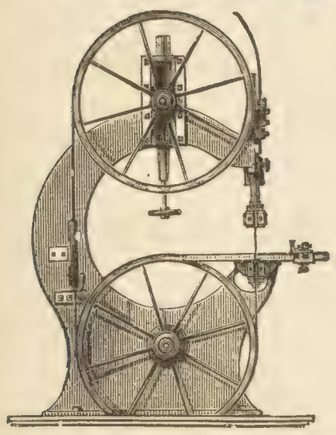
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so long used and so highly recommended as the cheapest and best covering for all outside work ever offered. The CAR COLORS are all ground in Pure Boiled Linseed Oil, and packed in all sized kegs and barrels.

Samples of all the Colors, with Price-List, will be furnished on application.

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Wood Cutting Machinery



FOR

Railway-Car Building, Ship-Building, and Band Sawing.

The Celebrated French "**M. PERIN & CO.**" Band Saw Blade,

ANY LENGTH AND WIDTH.

RICHARDS, LONDON & KELLEY,

ATLANTIC WORKS,

SEND FOR CIRCULAR. **22d, Above ARCH, PHILADELPHIA, PA.**

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IMPROVED PLASTIC SLATE.

Will repair and preserve old Roofs of Shingles, Tin, Cement, or of any kind, CHEAPER and more substantially than any thing else in use. It has been tested and improved upon for TEN YEARS, and is a perfect protection against *Weather* and *Fire*, and is INDORSED by EIGHTY-TWO FIRE INSURANCE COMPANIES. Reference is made to over **2000** *Roofs* in New-York, on CHURCHES, BROWN STONE DWELLINGS, FACTORIES, etc. It is equally good for *Steep* or *Flat* Roofs, and is easily applied on old or new buildings.

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PLASTIC SLATE PAINT, 60 CENTS PER GALLON. 1 gallon will cover nearly 200 square feet.

Plastic Slate Roof Coating, THICK, 60 cents per gallon. 1 gallon will coat about 100 square feet.

Plastic Slate Cement, for pointing up Chimneys, etc., 10 cents per pound.

One, Two and Three-ply Roofing Felt and Building Paper, 1, 2 and 3 cents per square foot.

Materials put up for shipment to any point, with simple instructions for use.

General Merchants should sell these Improved Plastic Slate Roofing Materials, as they can recommend them with entire confidence.

EDWARD VAN ORDEN & CO.,

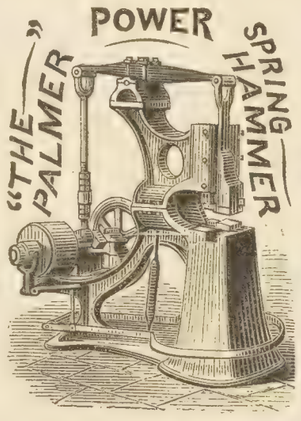
(Established 1863,) Sole Manufacturers, 79 Maiden Lane, N. Y.

THIS HAMMER

Awarded the First Premium of a Silver Medal

AT THE

American Institute Fair, N. Y. City, Nov., 1873.



Superior in every point to any modification of the Trip Hammer.

Simple, Powerful,

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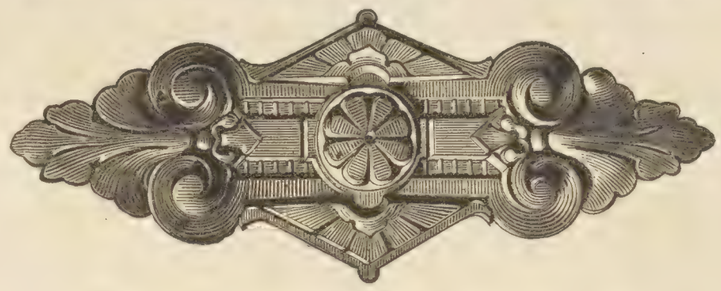
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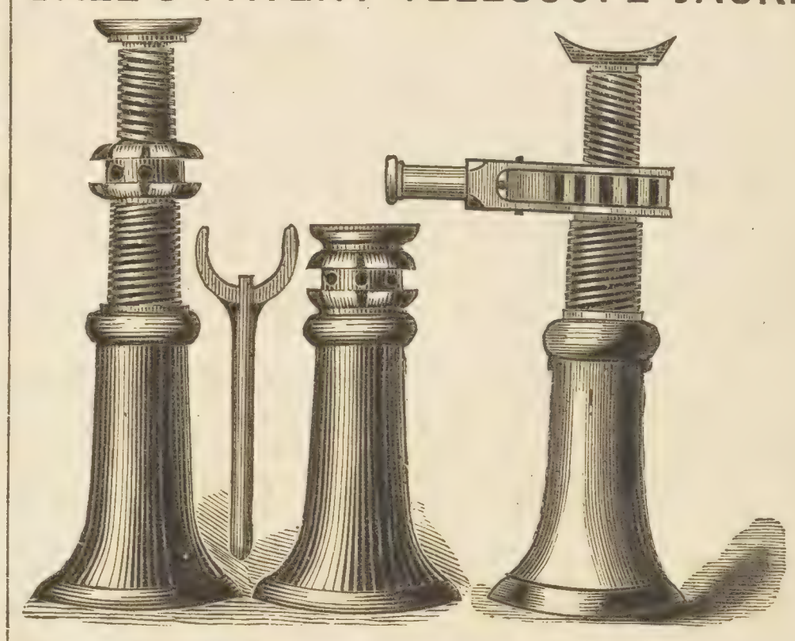
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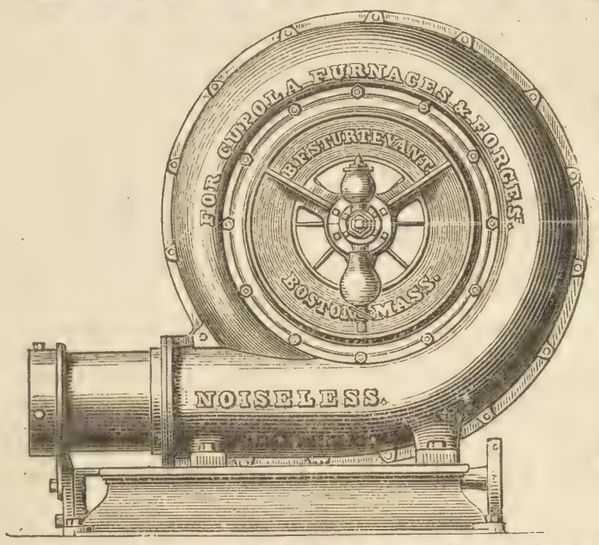
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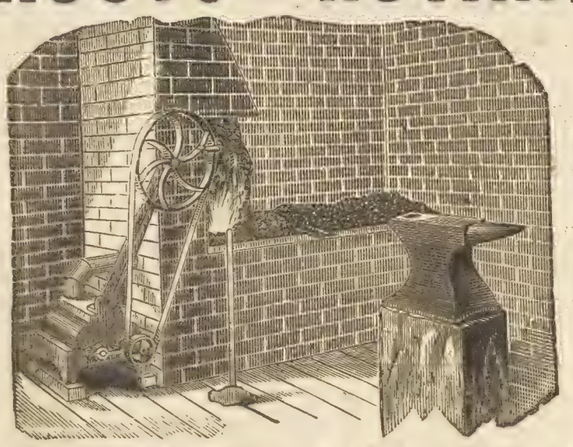
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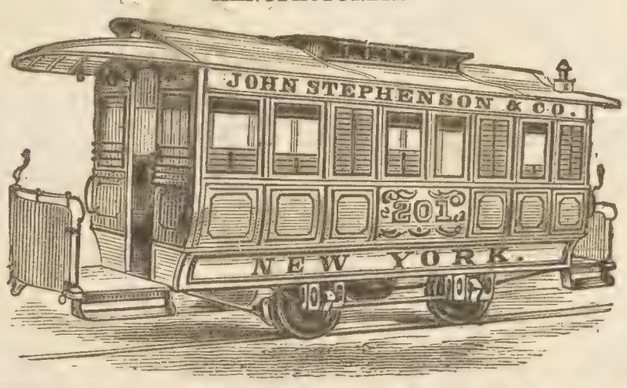
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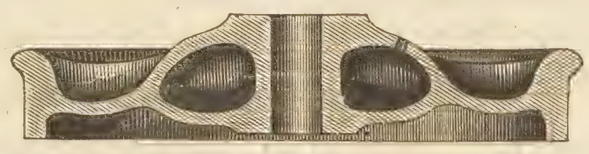


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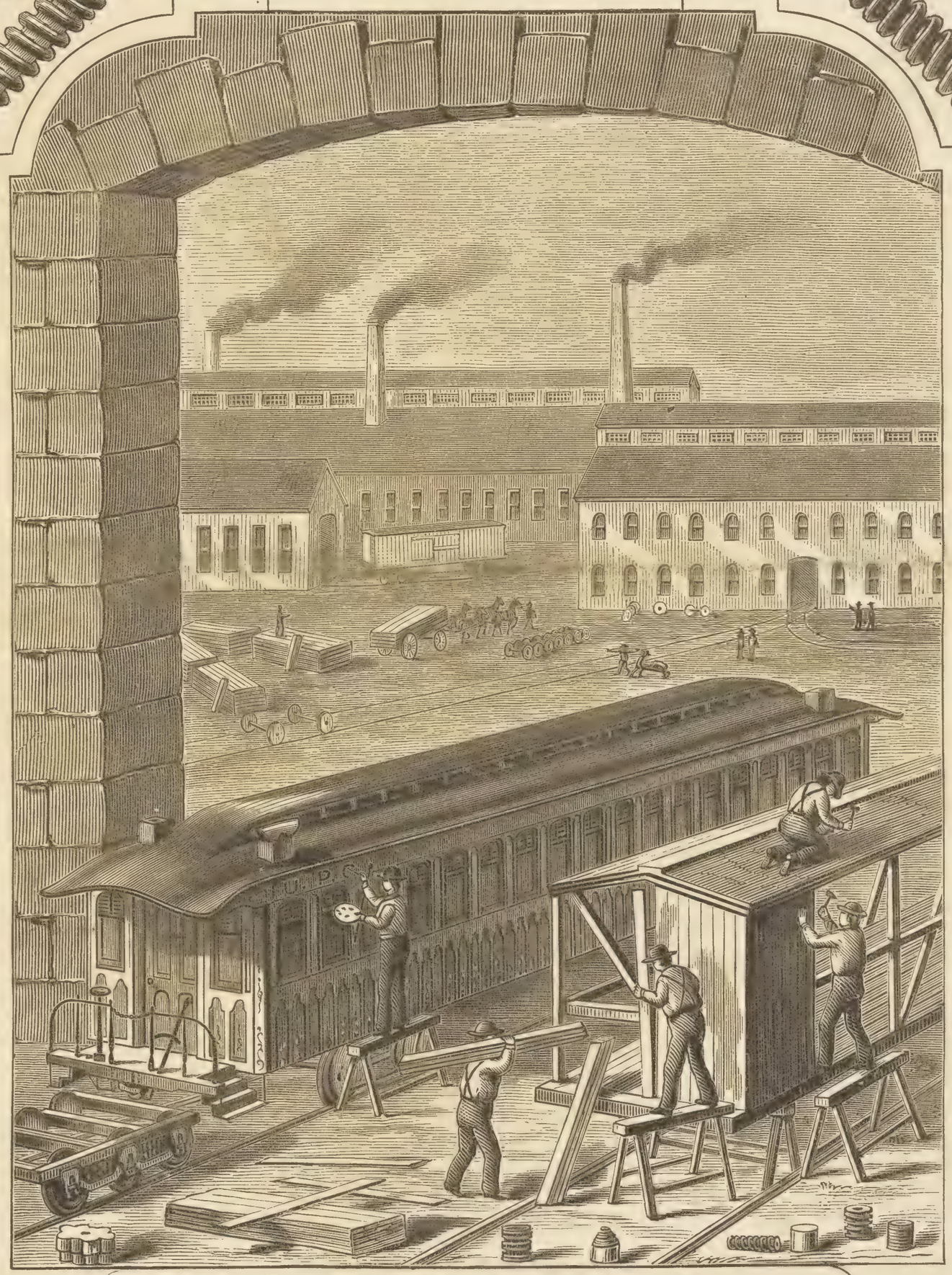
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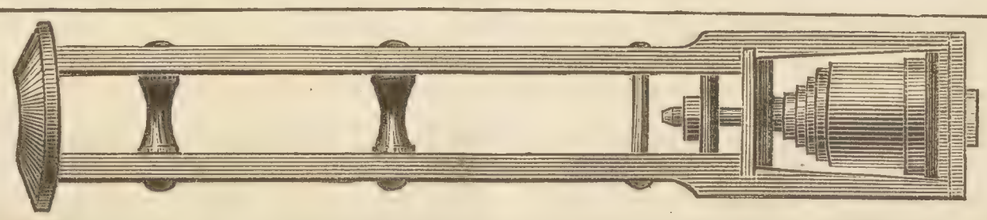
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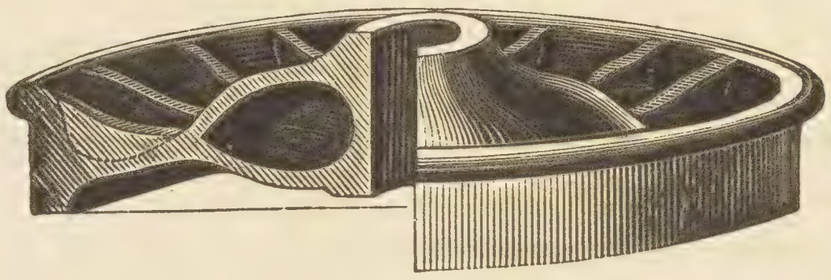
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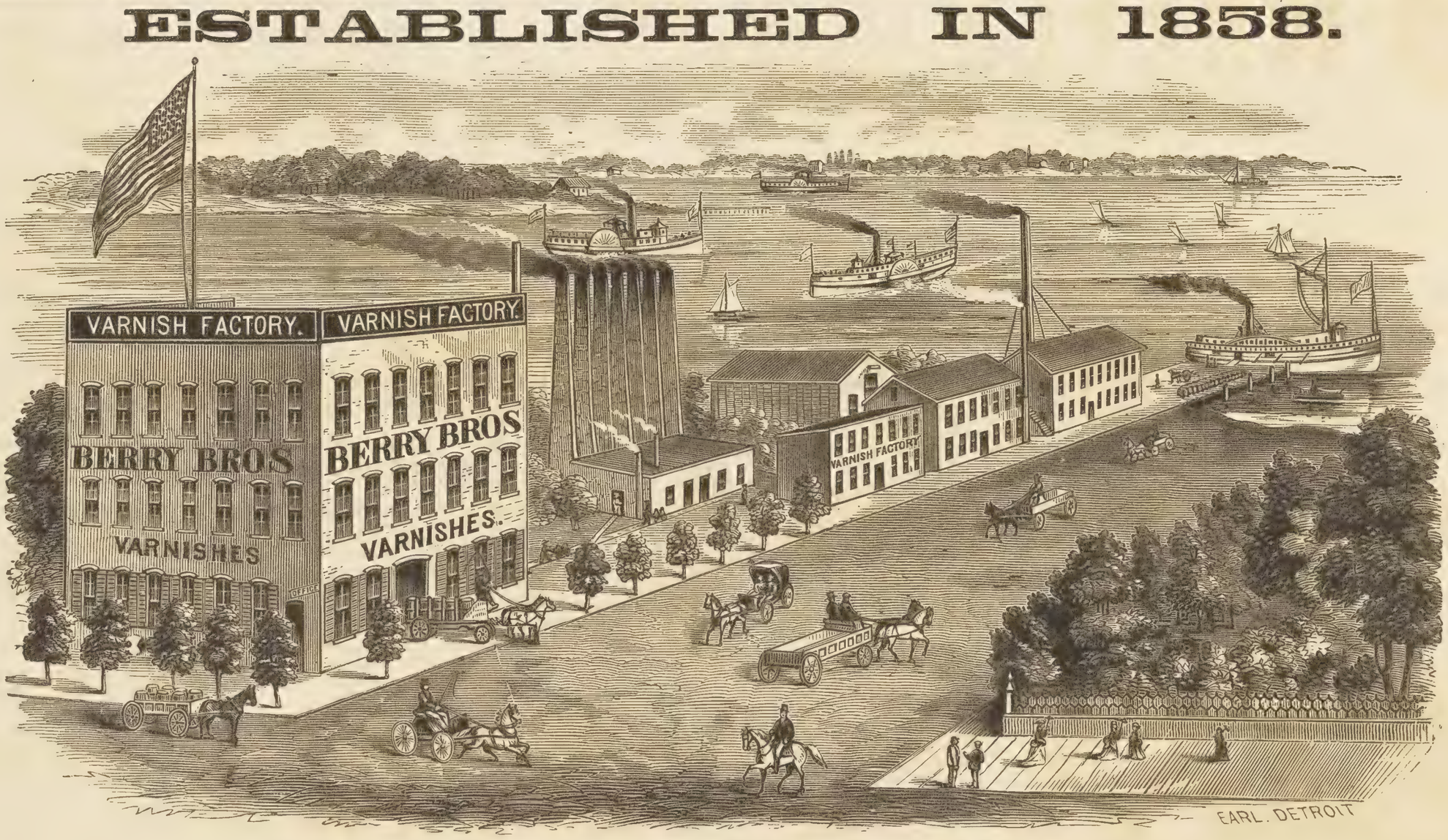
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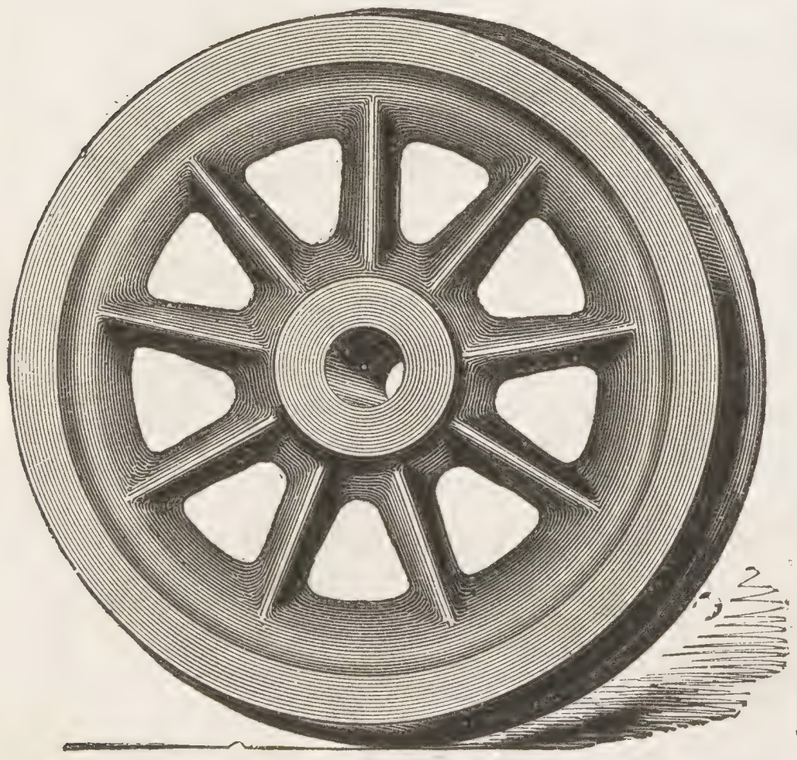
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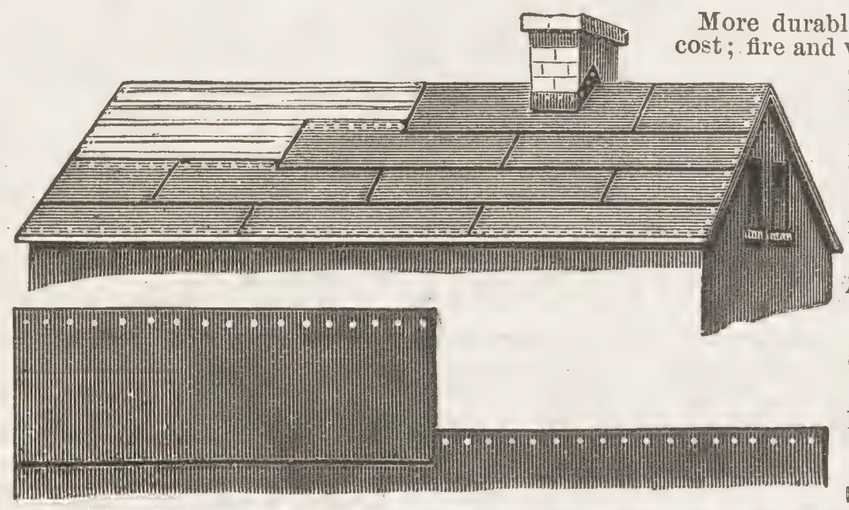
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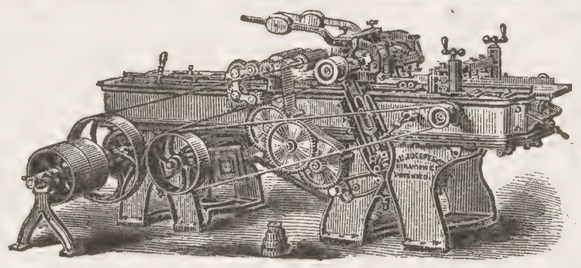
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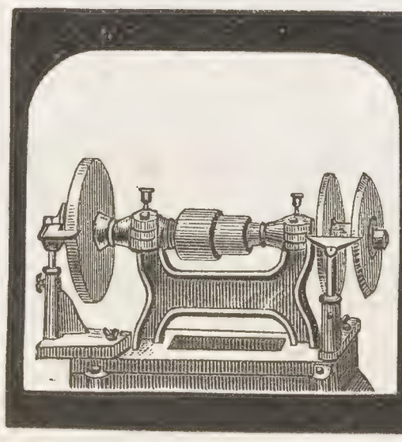
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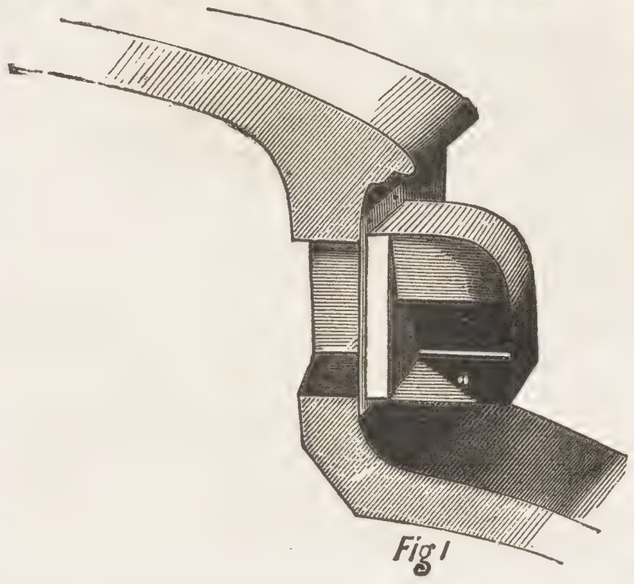


Fig 1

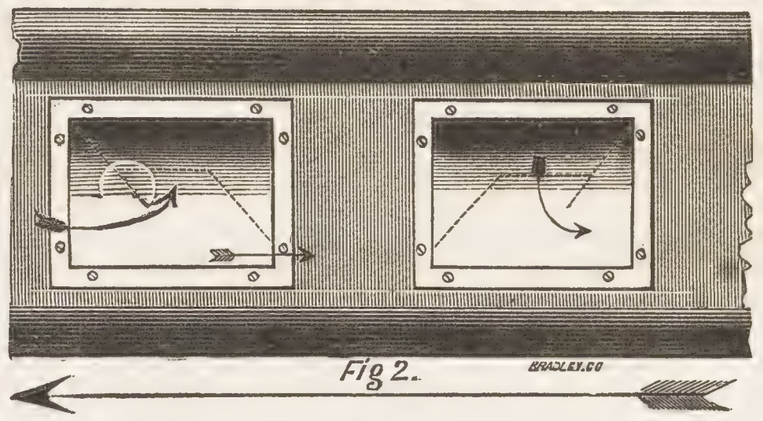


Fig 2.

THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place, it is always in readiness, and runs itself independent of all employees.

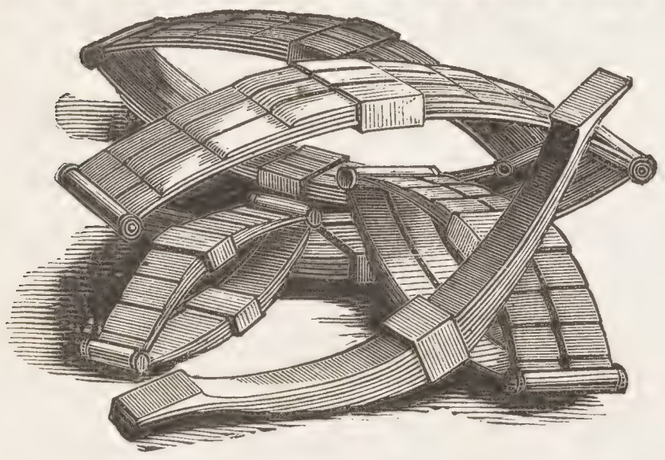
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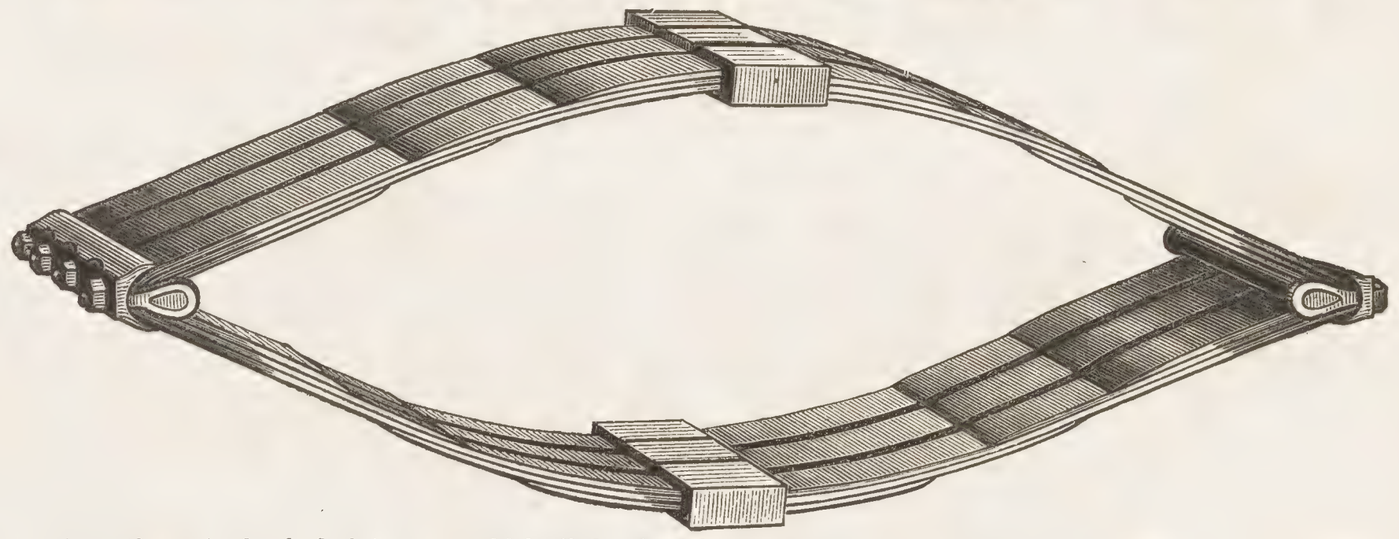
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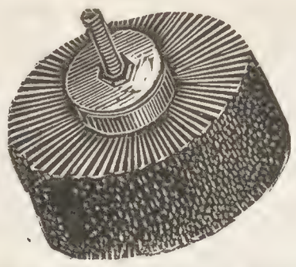


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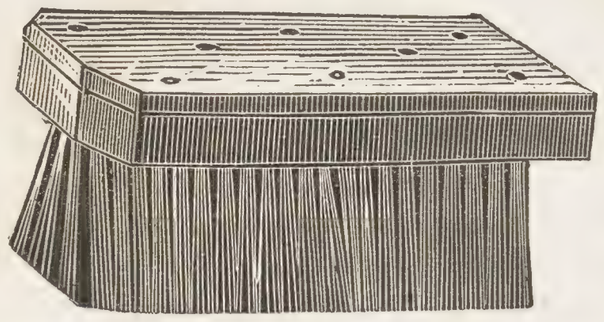
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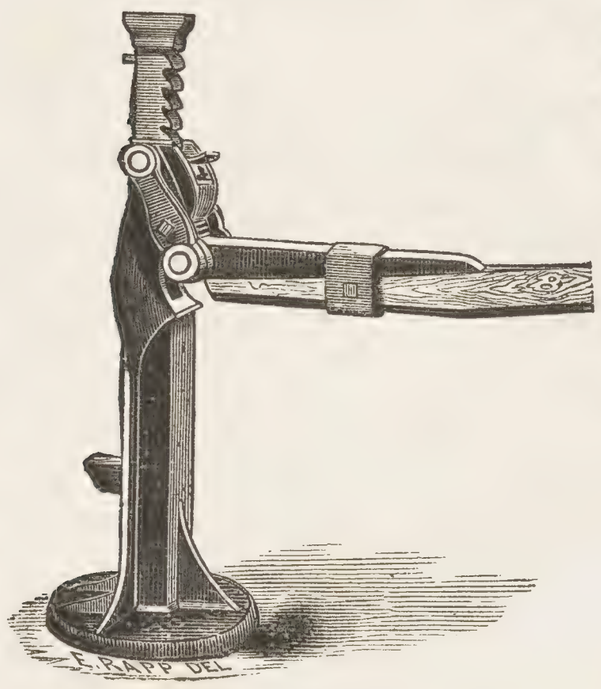
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Nearly all the Railroads in the United States have these Jacks in use, and the testimony in every instance shows a very great economy in

LABOR, TIME, AND EXPENSE.

Orders solicited and promptly filled. Address,

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Springfield, Ohio, and
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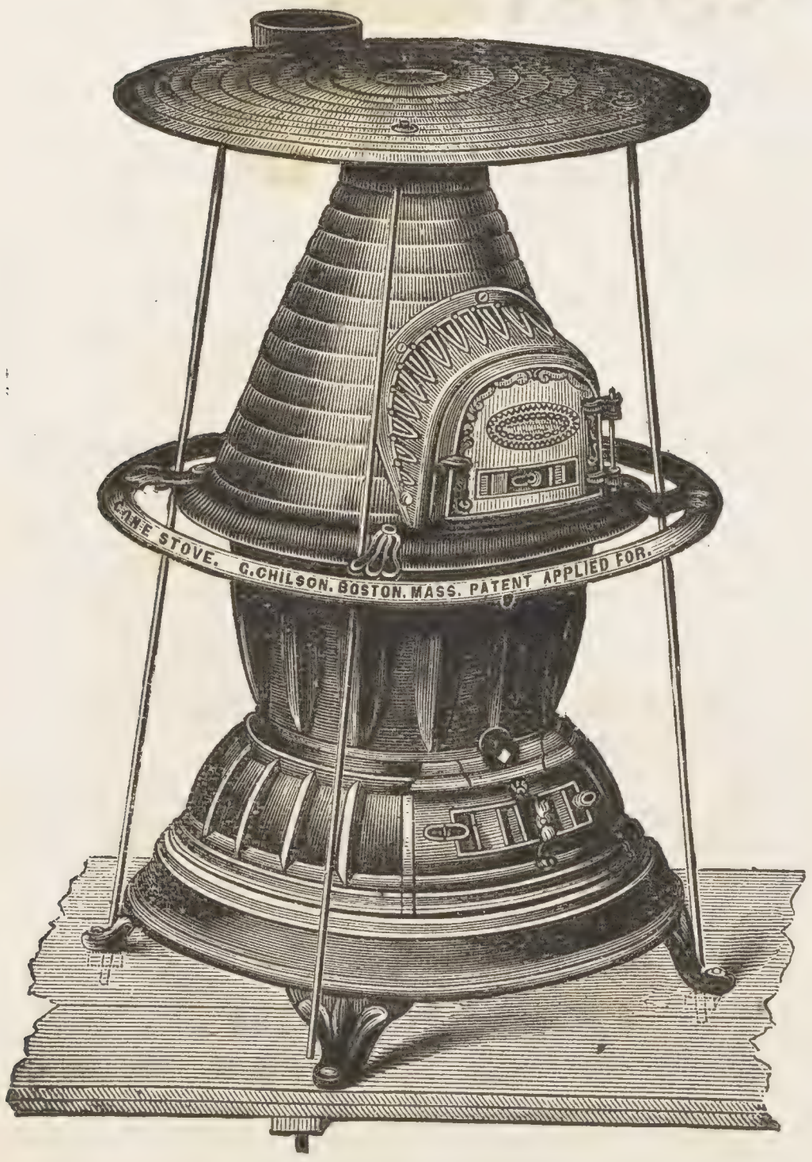


Views of Buildings, Machinery, Landscapes and Book Illustrations, at reasonable rates.

A NEW RAILWAY CAR STOVE.

Chilson's Patent Cone Disk Stove

ON A NEW AND MODEL PLAN.



I WOULD respectfully call the attention of Railway Managers and others interested in warming Railway Cars, Station Houses, etc., to this Stove, which has been thoroughly tested on several of our railways for a few years past, and has proved in every instance the most successful plan yet devised for thoroughly warming Railway Cars. This Stove is on a new and model plan, differing in principle and operation from all others in the United States. I claim for it *Safety, Economy, Durability, Simplicity, Cleanliness, and Beauty of Design.* Its peculiar merits may be stated as follows:

1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.
2. The broad radiating disk prevents the heat from ascending to the upper part of the car or room, but distributes and throws it down to the floor, thoroughly warming the lower currents of cold air in the car or room for a great distance around the Stove, thus securing the long desired object of making the *lower part of the car and floor comfortably warm, especially for the feet.*
3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stoves.
4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.
5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*
6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories, Stores, Offices,* RAILROAD CARS, and STATION HOUSES, *School Rooms, Workshops, etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

The BOSTON AND PROVIDENCE RAILROAD COMPANY have over two hundred of these Stoves in use, and the BOSTON AND ALBANY and several other Roads are adopting them, with the most perfect success.

BOSTON AND PROVIDENCE RAILROAD CORPORATION,
Superintendent's Office, Boston, April, 1873.

GARDNER CHILSON, Esq.: *Dear Sir:* We have about two hundred of your new "Cone" Disk Stoves in use, (a part of them for nearly five years,) for warming Passenger Cars and Stations. I can truly say that they have given entire satisfaction. These Stoves possess many important advantages over any other we have ever used, viz.: for warming the floor and displacing the cold air in the lower part of the car, whereby they are rendered much more comfortable, especially for the feet, than by any other plan known to us. The Stove is more economical in the consumption of fuel, more substantial in construction, and consequently requiring less repairs than any other in use, and so securely constructed as to prevent fire from getting out of the stove even should the car be *overturned.* I cheerfully give my testimony in favor of this Stove, and commend it to all Railroad Managers.

Yours, etc., A. A. FOLSOM, *Superintendent.*

Numerous other testimonials received from Railroads and other persons having these Stoves in use in Halls, Stores, etc., may be seen at office. Bolts are not required except for Cars and Steamboats.

Chilson's Improved Celebrated Cone Furnaces, for setting in Brickwork or in Portable Casings, Chilson's Unrivaled Double-Oven Brick Cooking-Range; Chilson's New and Splendid Arlington Portable Range; Chilson's very Superior Arlington Cooking Stove; Parlor, Office, and Store Stoves, Parlor Grates, Registers, Ventilators, etc.

Special attention given to putting up Furnaces and Ranges, and the ventilation of buildings in any part of the country.
☞ Nothing but strictly first-class work is manufactured by me. ☜

Warerooms, Nos. 99 & 101 Blackstone Street, Boston.
FOUNDRY AT MANSFIELD, MASS.

GARDNER CHILSON.

RAWLINS' METALLIC PAINT,

WYOMING.

Warranted Fire, Water, and Weather Proof.

Will cover more surface and outwear any paint manufactured.

CHICAGO, BURLINGTON, AND QUINCY RAILROAD,
MASTER PAINTER'S OFFICE,
AURORA, ILL., March 15, 1875.

RAWLINS' METALLIC PAINT CO.

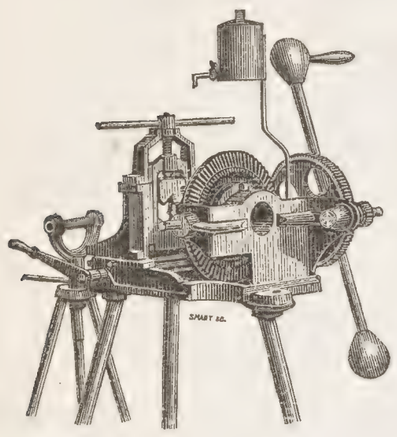
GENTLEMEN: I have had your IRON PAINT in test for about six months, and find it one of the best, if not the best, Iron Paints I have ever seen. *I put two coats of it, mixed with boiled oil, on a piece of sheet-iron, and buried it in* STRONG BRINE, *about six months ago, and it has stood the test, and* DOES NOT SHOW ANY SIGNS OF RUSTING THROUGH THE PAINT. I have also used it on Locomotive work, and find that it COVERS FAR MORE SURFACE than any Iron Paint I have used.

Very respectfully yours,
D. C. COOLEY.

CHASE'S

Pipe-Cutting and Threading Machine.

(W. D. CHASE'S PATENT.)



This important tool is designed to fill a want long felt by STEAM AND GAS FITTERS AND MACHINISTS for cutting and threading pipes rapidly and cheaply. An Apprentice Boy, with one of these, can do more work than Two Men with old appliances under the old system. No PIPE SPLITTING! No BEVEL INSIDE OR OUT! It cuts threads and makes nipples for all sizes of pipes, from ⅛ to 2 inches. Weighs only 100 lbs. Stronger than any machine made. A full set of collars and lengths for making nipples goes with machine. For Sale by

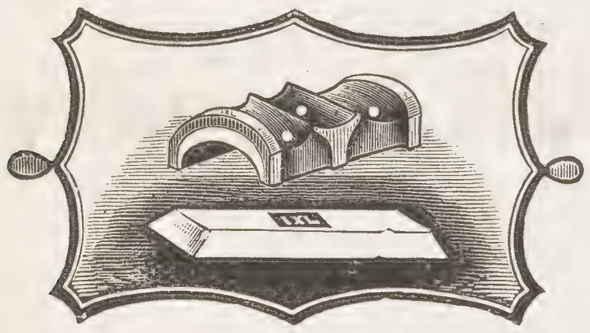
MORRIS, TASKER & CO., Philadelphia, New-York, and Boston.

Address.

The Chase Manufacturing Co.,
120 Front St., New-York.

Send for Circular.

ORGANIZED MAY 1869.



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No. 7 North Third Street, ST. LOUIS, MO.

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I X L ANTI-FRICTION METAL

AND JOURNAL BEARINGS,

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EMPIRE PORTABLE FORGES

NO BELTS, BELLOWS OR CRANKS,
THE BEST MADE.
Send for Catalogue to the
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"DEAD STROKE" POWER HAMMER.

IMPROVED ADJUSTABLE CRANK PIN.
STRIKES BLOW HEAVY OR LIGHT, FAST OR SLOW.
Prices Reduced Jan. 1st, 1875.
The Hull & Belden Company, Danbury, Ct.

IRON CLAD PAINT.



Address IRON CLAD PAINT COMPANY,

CLEVELAND, OHIO.

This Company owns and manufactures under WM. GREEN'S several patents, and is the only Company in the world that makes Paint from pure hard Lake Superior Iron Ore, such as is used in furnaces for making Pig Iron.

The most Economical, Most Fireproof, Most Waterproof, Most Durable, and Most Useful Paint made.

Used by L. S. & M. S. RY. I. & ST. L. R. R.
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Etc., etc.

OFFICE OF PURCHASING AGENT
LAKE SHORE AND MICH. SOUTHERN RAILWAY,
CLEVELAND, O., Sept. 12, 1873.

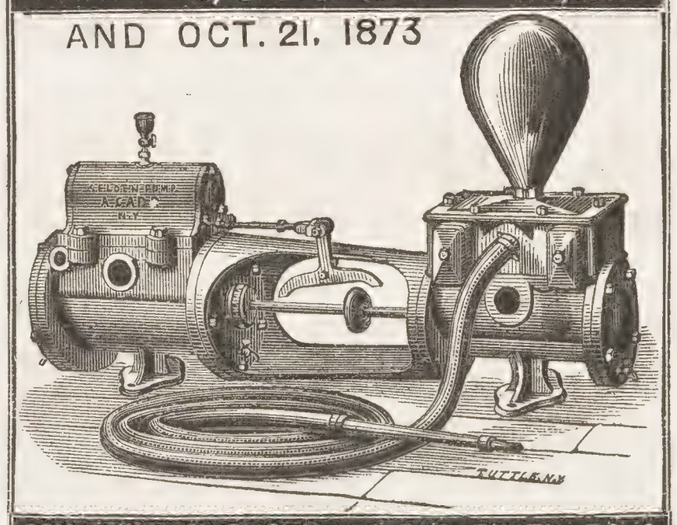
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GENTLEMEN: Your "Metallic Paints" known as "*Iron Clad Paints*" have, in the past six years, been extensively used and thoroughly tested by this Company, as to their *covering capacity, durability, and resistance to atmospheric changes*—latter "paint destroyer"—the most difficult to overcome in outside paints. We can emphatically accord them the highest position over any paint heretofore produced, for Cars, Roofs, Stations, Bridges, etc. The monthly increase of our orders is the best evidence that the Paint is constantly growing in favor with our mechanics.

Very respectfully yours,
A. C. ARMSTRONG,
Gen'l Purchasing Agent L. S. & M. S. R. R.

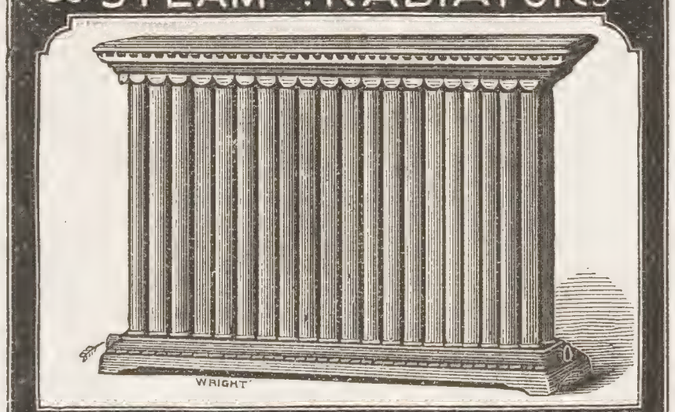
THE SELDEN DIRECT-ACTING STEAM-PUMP

PAT. AUG. 2, 1870. DECEMBER 20, 1870
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COMBINING SIMPLICITY AND DURABILITY TO A REMARKABLE DEGREE. ITS PARTS ARE EASY OF ACCESS AND IT IS ADAPTED TO ALL PURPOSES FOR WHICH STEAM PUMPS ARE USED

A. CARR
MANUFACTURER AND PROPRIETOR,
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CARR'S POSITIVE CIRCULATING
STEAM RADIATOR



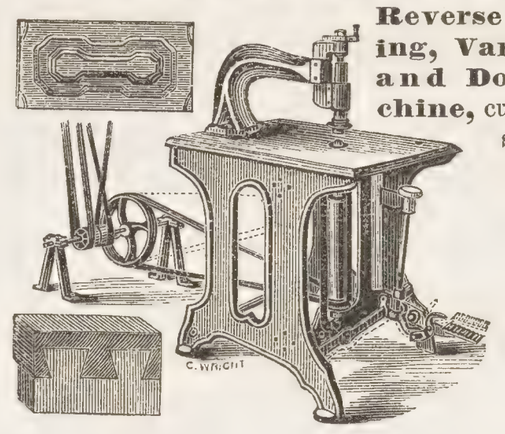
THE ONLY UPRIGHT STEAM RADIATOR MADE WHICH HAS A POSITIVE CIRCULATION.

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WROUGHT AND CAST IRON PIPE, BRASS WORK & C.,
FOR
PLUMBERS, STEAM AND GAS FITTERS.

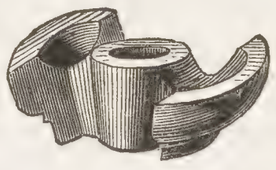
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BOULT'S PATENT



Reverse Motion, Paneling, Variety Moulding and Dovetailing Machine, cuts Panels of any design or style of Mould in the solid wood, with neatness and dispatch. Is a first-class Shaper, Edge and Scroll Moulder. Does general Dovetailing with thick or thin stuff.

Simple, Durable, and Efficient.



☞ Send for Pamphlet and sample of work.

Improved Solid Steel Cutters for all kinds of Variety Moulders made to order, and warranted by the

B. C. MACHINERY CO.,

Battle Creek, Mich.

WALL'S MAGIC RENOVATOR.

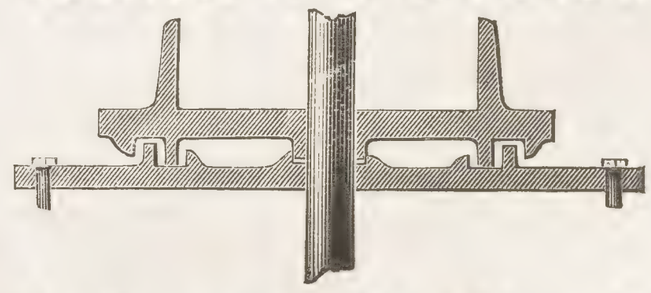
For Cleaning and Polishing Gold, Silver, Nickel, Brass, Copper, and Lacquer Gilt on Metals. A chemical liquid free from acids, which will remove all tarnish, dirt, and grease, from whatever cause, almost instantaneously, and without injury to the metal.

Price, per gallon, $5; in pint bottles, $1; ½ pint, 50 cents. Discount of five per cent on orders for ten gallons. A liberal commission to Agents.

Samples sent on application to

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WARD'S PATENT



CENTER OR TRANSOM PLATE

FOR RAILWAY CARS,

With Oil Receptacle for Bearing-Ring to work in. They are acknowledged to be the best in use. See description and drawings in CAR-BUILDER for January, 1874.

Address, AMBROSE WARD,
ALTOONA, PA.

ST. CHARLES CAR CO.

This Company is now prepared to furnish on short notice, and at low prices, all kinds of

FREIGHT CARS,

built in the most approved manner and of the best material. Orders respectfully solicited. Address,

ST. CHARLES MFG. CO.,
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REFERENCES.

THOS. ALLEN, Pres't St. Louis, Iron Mountain & Southern R.R.
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A. W. LOPER, Ass't Sup't St. Louis, Iron Mountain & S. R.R.
WM. HOGE, Pres't St. Louis, Kansas City & Northern R.R.
W. C. VAN HORN, Gen'l Sup't St. Louis, Kansas City & N. R.R.
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TRADE MARK
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Moss
NEW ORLEANS

Trade Mark, Registered May, 1874.

FERGUSON & HABER,

PROPRIETORS AND MANUFACTURERS OF THE

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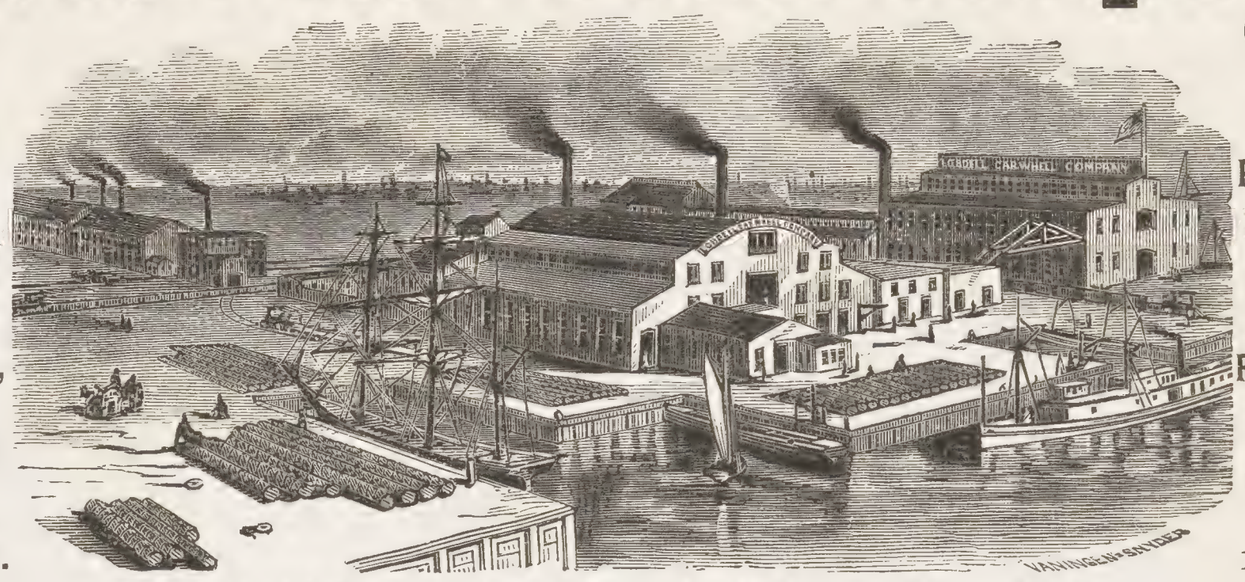
FACTORY—162 FRONT and 160, 162 and 164 DELTA ST., N. O.

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Having perfected and patented our machinery, we guarantee all Moss put up by us to possess the following qualities—*full length of fibre, freedom from dust, strictness of grade, preservation of elasticity, and exactness of weight,* and used with great success by the leading carriage makers, upholsterers and railroad companies in the United States, as the most economical substitute for curled hair.

Lobdell Car-Wheel Company.

SINGLE AND DOUBLE PLATE AND HOLLOW SPOKE WHEELS, FOR City and STEAM ROADS.



CHILLED ROLLS FOR PAPER, BRASS, COPPER, AND ROLLING MILLS. Castings of all Descriptions.

WILMINGTON, DELAWARE.

GEO. G. LOBDELL, PRES'T. W. W. LOBDELL, SEC'Y. P. N. BRENNAN, TREAS.

Stimson & Babcock,

VARNISH MAKERS,

Boston, Mass.

RAILWAY CAR VARNISH.

Elastic, pale, and extremely durable, possessing great brilliancy of lustre, and producing a hard, fine **finish,** resisting in the highest degree effects of time and exposure. Should be used over our Rubbing.

RAILWAY RUBBING VARNISH.

Hard-drying, works freely on large panels, will not sweat out, and is very desirable where a fine and durable surface is requisite on which to finish.

LOCOMOTIVE VARNISH.

Dries readily, with brilliant lustre; durable under severest exposure in any climate.

INSIDE CAR VARNISH.

A hard-drying Varnish for inside work; is very light-colored, flows well, and dries in about 12 hours.

JAPAN GOLD SIZE.

Very pale, and preferable to Japan as a drier for delicate colors.

COACH PAINTERS' JAPAN.

A Superior Drier.

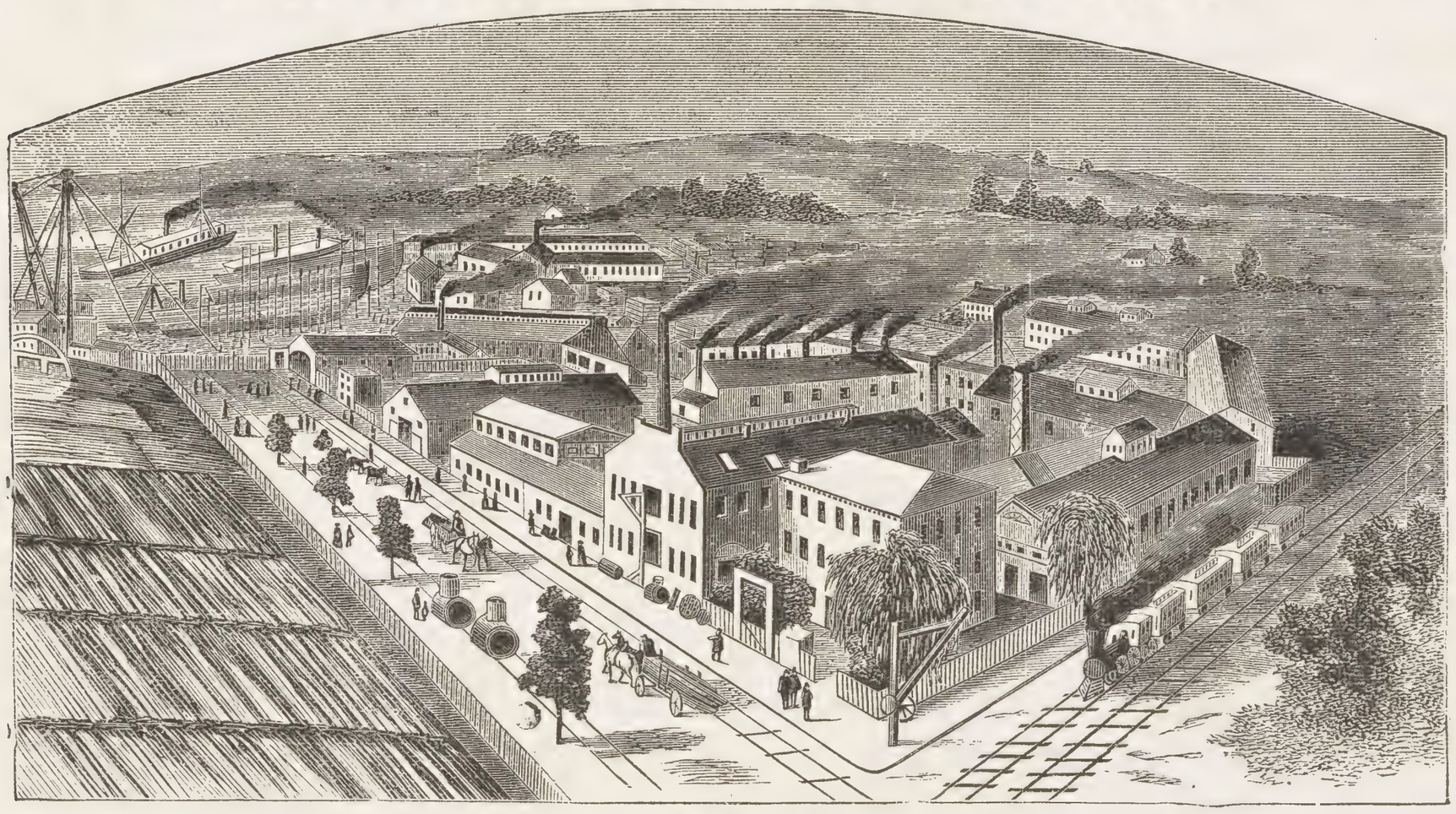
These **VARNISHES** are made with the greatest care and skill, from the best grade of stock, and designed especially for

RAILWAY CAR AND LOCOMOTIVE WORK.

They dry hard, and resist effectually the severest exposure to action of **Cinders, Smoke, or Climate,** having been tested for many years by the leading Railroads of this Country and have proved, for **brilliancy** and **durability,** fully equal to any of either Home or Foreign Manufacture.

THE HARLAN & HOLLINGSWORTH CO.,

WILMINGTON, DELAWARE,



BUILD ALL KINDS OF

RAILROAD CARS:

FIRST and SECOND-CLASS DRAWING-ROOM, SLEEPING, BAGGAGE, MAIL, and EXPRESS, BOX, and FLAT.

MURPHY & CO., NEWARK, N. J.,

MURPHY, SHERWIN & CO. CLEVELAND,

Varnish Makers.

We call attention to the following prices of our Varnishes especially adapted to Railway Uses, and submit that they combine more prominently than any others, the INDISPENSABLE REQUISITES for Railway Consumption. They are of heavy body, light color, quick drying, and are guaranteed to give a maximum of durability.

Wearing Body, (For Outside Finishing.)	**$5 50**
Hard-Drying Body, (For Under Coats on Cars.)	**5 00**
Rubbing Body, (For Under Coats on Cars.)	**4 50**
Inside Car, (For Interiors of Cars.)	**4 50**
Engine Finishing, (For Last Coats.)	**5 00**
Engine Rubbing, (For Under Coats.)	**4 50**
Japan Gold Size, (For Binding and Hardening Colors.)	**3 50**
C. M. Japan, (For Drying and Binding Paints.)	**2 00**
Black Enamel, (For Smoke Stacks of Engines.)	**3 00**
No. 1 Black, (For Iron-Work.)	**1 50**

UNIFORM SUPERIORITY IN QUALITY AND FIXED PRICE TO ALL will continue to characterize these goods, and Satisfaction in their use is assured.

JOHN JEWETT & SONS,

182 FRONT ST.,

New-York,

MANUFACTURERS OF

PERFECTLY

Pure

WHITE LEAD AND LINSEED OIL.

JEWETT & SONS PERFECTLY PURE WHITE LEAD TRADE MARK

JEWETT'S PERFECTLY PURE LINSEED OIL RAW, BOILED & REFINED.

JOHN T. LEWIS & BROS., WARRANTED PURE WHITE LEAD. PHILADA.

TRADE MARK.

JOHN T. LEWIS & BROS.,

No. 231 South Front Street,

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MANUFACTURERS OF

White Lead, Red Lead,

LITHARGE,

ORANGE MINERAL,

LINSEED OIL,

AND PAINTERS' COLORS.

☞ **READ ECKSTEIN, HILLS & CO. ADVERTISEMENT.**

Page 1.

THE DISNEY CAR COUPLER,

Patented June 24th, 1874. Manufactured by

F. E. CANDA & CO.,

CHICAGO, ILL.

Fig. 1.

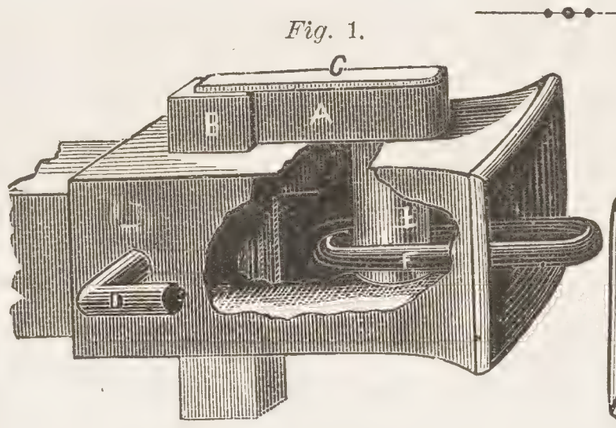


Fig. 2.

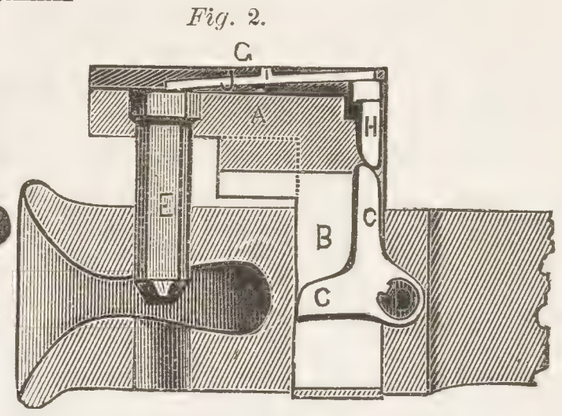


Fig. 1 represents the draw-head with a portion broken away to show the interior.

Fig. 2 represents a vertical, sectional view. *A B* we designate *The Drop*, the upper part *A* serving as the pin-holder. *D* is a lever by which the device is operated, fastened to a shaft passing through the draw-head. *C C* is a forked piece keyed to this shaft. *H* is a small loose pin. *E* is the large pin for securing the link *F*. *J* is a lever resting on the heads of pins *E* and *H*, with its fulcrum on cap-piece *G*. *Then*, when set for coupling or uncoupling, as in Fig. 2, the link *F*, in passing the mouth of the draw-head, raises pin *E*, which by lever *J* forces pin *H* against and displaces the upper arm of *C C*, allowing the *drop* to fall, carrying pin *E* with it.

From the above cuts and description it is apparent that this device combines simplicity in its construction, reliability in its working, and durability in all its parts.

We designate as points of special advantage:

That working from the side of the draw-head, it leaves no opening at the top for dirt, gravel, or accumulations of ice and snow to interfere with the working of the coupler.

That, while the link is always held in a horizontal position for entering, yet it has sufficient vertical movement to accommodate itself to cars of different heights, not exceeding a variation of six inches, without using the crooked link.

That the mouth of the draw-head is of such shape as secures the pin from all liability of bending or breaking.

That it always couples when desired, or set for coupling, and will *never* couple when not desired.

That, working readily from the top and sides of cars, there is no risk of life or limb.

That the pin can never be lost or stolen.

And further, *that* from its reliability of working, and durability of parts, combined with the device for securing it to passenger cars, makes *This Coupler* the safest and by far the most economical *Passenger Car* Coupler ever introduced.

The Disney Car Coupler, wherever tried or however thoroughly tried, has given the most perfect satisfaction, both as a Freight and Passenger Car Coupler.

For further information, address

H. C. KIBBE, 419 California St., San Francisco, Cal.,

AND

F. E. CANDA & CO., Railroad Contractors and Car Builders,

79 SOUTH CLARK ST., CHICAGO, ILL.

THE Atlantic White Lead

AND

LINSEED OIL COMPANY,

Manufacturers of

WHITE LEAD,

DRY AND IN OIL.

RED LEAD AND LITHARGE,

CRUSHERS OF LINSEED OIL.

ATLANTIC WHITE LEAD. PURE. WARRANTED. ROBERT COLGATE & CO.

TRADE-MARK.

Robert Colgate & Co.,

287 Pearl St.,

NEW-YORK.

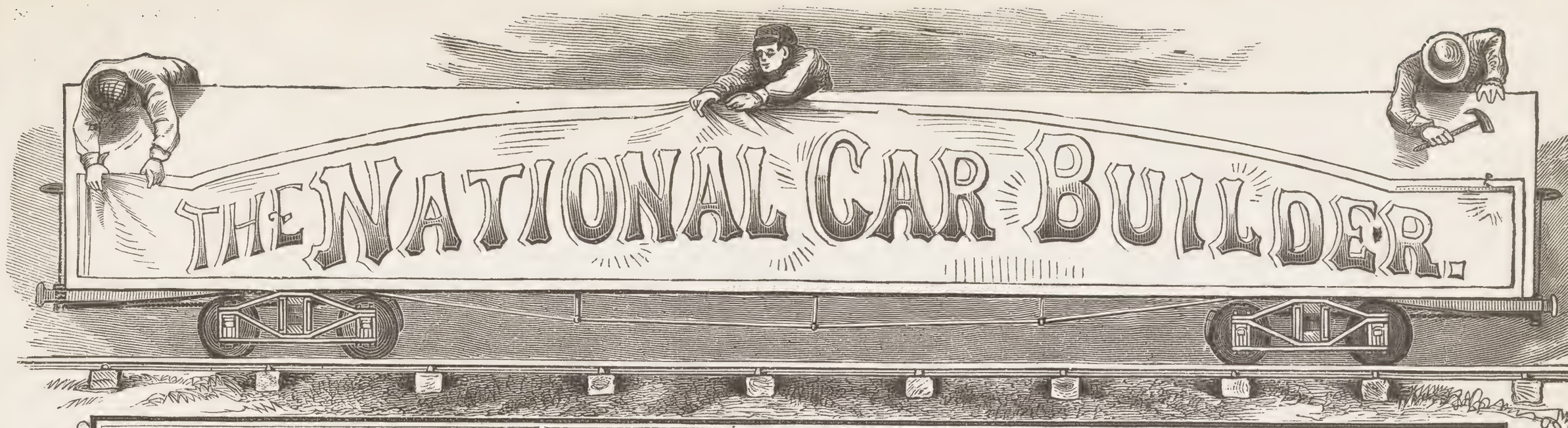
KATAHDIN CHARCOAL PIG IRON.

O. W. DAVIS, Jr., Manufacturer, BANGOR, MAINE.

SOUTH BOSTON IRON CO.'S TESTS OF KATAHDIN PIG IRON, 1874:

	Density.	Tensile strength per square inch.
No. 2 Pig Iron,	7,2002	18,894
" 3 "	7,2432	26,928
" 4 "	7,2305	30,765

Nos. 1 and 2 are soft and strong, suitable for machinery and fine castings, boiler plates and steel. Nos. 3 and 4 are close-grained and tough, adapted for steam cylinders, radiators, locomotive castings, car-wheels, hydraulic presses, etc. All grades contain less than one-tenth of one per cent of sulphur or phosphorus. Shipped by rail or water from Bangor to any part of the country.



DEVOTED TO THE INTERESTS OF RAILWAY ROLLING STOCK.

Vol. VI.
No. 8.

AUGUST, 1875.

$1.10 per Annum.
Single Copies, 10 Cents.

Ninth Annual Convention of the Master Car-Builders' Association.

(Continued from page 110.)

MR. HOPKINS.—It appears to me that the suggestion contained in your remark is just what we want. If each one will tell what they accomplish, then we may be able to determine what difficulty there is in one man not being able to do as much as another.

THE PRESIDENT.—If you have no further information to give on this point, I will read the next question :

What may be considered the lifetime or the mileage life of a strictly No. 1 *car-axle, hammered from scrap?*

A MEMBER.—Does that involve the number of miles it makes, or the number of years it runs? An axle might be fifteen years old, and yet not have run ten thousand miles, and it might have run five thousand miles in the same time.

THE PRESIDENT.—The question covers both points. It asks for the lifetime or for the mileage life. Certainly some of you gentlemen know about how long you allow your axles to run before you throw them out. You either wear them out or lay them by as not suitable for use.

MR. KIRBY.—We do not calculate to turn our freight-axles up when they are ten years old. Our passenger-axles are turned over to freight ; but when they are so turned over, we do not calculate to turn them up again. Two weeks ago I came across an axle that had been in use since 1856. It took 170 blows to break the axle after it had been cut all around with a cold-chisel ; so that the age of the axle does not always determine its condition. The axle had been in use all that time. But there is scarcely any thing that we purchase nowadays that is as good as it was made twenty years ago.

MR. MCVAY.—Our rule has always been to put all new axles under passenger-cars, and when they are refitted, to turn them over to freight. We make a practice of refitting our axles as long as they are large enough to make a perfect fit in the wheel-seat. We discard no axles on account of age, so long as they are of the proper size. As a general thing our axles will wear out by the ordinary refitting and smoothing up of the journals, before they are discarded. I do not think that our axles, as a rule, will run more than about twelve or fifteen years, although we have some axles that have been running for twenty years. We can not tell what the exact time is unless we have statistics that will show it. I have been told by master mechanics that there is no such thing as granulating an axle by actual use ; that an axle is just as good after it has run twenty years as the first day it was put under a car. Others think that by constant use and vibration the axle becomes granulated. That is a matter which has not been satisfactorily settled by any body as yet. Our custom has been to consider an axle suitable for service so long as it is of proper size to fit the wheel-seat. We discard our axles when they are reduced to 3¼ at wheel-seat and 2⅝ at journal.

MR. SOMERBY.—My orders are not to use an axle under our passenger-cars after it is two years old. It is then used under freight.

MR. CHAMBERLAIN.—It makes a great deal of difference with regard to the mileage of the cars. We have cars running on our road that only make 24 miles per day. If we change our axles under those cars once in two years, taking that as a criterion, we should be apt to run very far astray, I think. We have other cars that are running 12,000 miles per month ; and it would seem that there ought to be some discrimination between the two. When the journal is reduced to 3 inches the axles are abandoned ; I do not remember as regards the wheel-seat, nor can I say how long before the journals are so reduced. It depends somewhat upon the condition of the track. Tracks which are not in a perfect condition will wear out an axle faster on the back part of the journal than on the forward part.

MR. FORNEY.—Then I presume we shall have to let the matter stand in this way—that we do not know what the average life of an axle is. But there must be an average mileage, or an average time required to wear an axle down to a certain size.

MR. CHAMBERLAIN.—There is an average, of course, and I know what it is, but I have not got the figures with me.

MR. PARTRIDGE.—I think some of the axles that are under the cars now in use would show pretty small journals if they were calipered, and, if we could get at the ages, a pretty long mileage. Within the last 18 months I have seen axles taken from under cars, that have run down from 3-inch journals to 2-inch. I know of one set of axles under a car that had been carrying, or was supposed to be carrying, ten tons right straight along in the ordinary service ; and that one set was worn down to very nearly 2 inches in the journals.

MR. FORNEY.—Has our Chairman any idea of the actual number of miles an axle will run until it is reduced to 3 inches in diameter ?

THE PRESIDENT.—I can not give that information.

MR. HOPKINS.—I would like to call attention to the fact that in calling for information upon these various points, we learn how little we know, and, therefore, how important it is that we pay greater attention to these subjects in the future, and be able to come here and give more specific information.

MR. STEWART.—In giving the size of journals and wheel-seats, there ought to be stated the size of the journals when they are put under, so that we may know how much they are worn.

THE PRESIDENT.—The next question is :

In making bills for work done by one railroad company for another, it seems to be desirable that a uniform percentage should be added to such bills. Should the percentage be added to the labor only, or to the labor and material used?

MR. KIRBY.—Bills that come to our road for work done by other companies vary very much in this respect. Some roads charge 10, others 15, and some as high as 20 per cent. Some add the percentage to the labor, and others add it to both labor and material. I would like to have an expression of the sense of this meeting, in order that a more uniform system of charging may be established. It seems desirable that bills rendered for work done should be made as uniform as possible. Our custom has been to add 20 per cent to the labor only, charging the material at cost.

MR. ADAMS.—Bills come to us with different rates of percentage on labor, and sometimes on both material and labor. It is our usual custom to charge the same percentage, as nearly as we can ascertain it, that is charged to us by the roads for which we may be working. If they charge us 20 per cent we charge them 20. We have been governed somewhat by the bills that are sent to us. I think that such an arrangement has been very satisfactory all around ; but I would like to hear an expression of opinion from the members. Certainly each member can give us some information upon the subject.

MR. KIRBY.—It has been our custom to charge no percentage. We do not think others should charge us any thing, and we have not charged any thing except the cost of the material and labor. I have never seen any percentage charged on any of the bills that have been sent to me, and I have treated other folks the way I thought they were treating me.

MR. GRIFFITH.—Our custom has been about the same as that stated by Mr. Adams. We charge about the same percentage to others that they charge to us, differing from 10 to 15 per cent. I think it very desirable that there should be some uniform rule. I think that 10 per cent, as a general thing, would be about right.

MR. MCVAY.—Our rule has been to charge to outside parties 10 per cent on the labor, and nothing on the material used. We consider 10 per cent on the labor as an offset for the use of machinery and for some labor that may not be charged up. We treat everybody alike.

MR. FURGUSON.—The instructions from our superintendent are to charge 10 per cent on the face of the bill to a foreign company, both on labor and material.

MR. STEWART.—Our custom has been to charge the actual cost, taking every thing into consideration. It seems to me that it is unnecessary to make an extra charge above the cost. We charge, therefore, just what it costs us, with no profit on the work. It is as fair for one side as for the other.

A MEMBER.—If only the actual labor performed is charged for, you do not get any thing for the services of the superintendent, which should be included, and also the use of the machinery, and the interest on the investment. These, and many other things, should be taken into account.

MR. STEWART.—That would all be included in the cost.

On motion, the Convention adjourned until to-morrow morning.

THIRD DAY'S PROCEEDINGS.

THE PRESIDENT.—The first business in order will be the report of the Committee on Car-Wheels ; Best Method of Fitting ; Flange Wear and Causes ; Mileage and Breakage.

MR. KIRBY.—I am one of that committee—the second name on the list. Unfortunately, the chairman of the committee is not here, but sent word Wednesday morning of this week that he could not attend. He had sent no report, and that was rather a late day to get up one that would be of any value to this Association, and I would therefore ask that the committee be discharged and another one appointed ; and let us see that there is a report made next year that will be of some value. It is an impossibility to get up a report in two days here in New-York. My object in coming to this meeting is to do business and hear what other members have to say ; and I do not like the idea of being shut up in a committee-room while the sessions are going on. I make this apology for not having any report ready.

MR. DAVENPORT.—I think that Mr. Kirby's reasons are good, and his explanation is in my judgment satisfactory, inasmuch as he had every reason to suppose that the chairman would be here. We understand, of course, that a report on this subject can not be gotten up in a minute, especially in the pressure of business. Therefore I would move that the verbal report of Mr. Kirby be received, and that the committee be reorganized.

The motion was carried.

MR. CHAMBERLAIN.—I hope that the members will enter into some discussion with regard to the wheel business. I have seen the reports received from the different members, and from those reports I think the committee would have had a hard job to make up an A No. 1 report. But if the members will take hold the coming year, and introduce the mileage system on their roads, or at least on some cars that they have absolute control over, we may at the next meeting get some very valuable information.

MR. KIRBY.—I would say, in connection with that, that we received seven replies to the circulars sent out. That does not speak very well for the desire of the members to help the committee get up their report. But the Association can not blame any one but themselves for not receiving a report, even though the chairman had been here. I should not have blamed *him* if he had not made any report at all. Where there is union there is strength ; and that, I suppose, is where our strength lies, and not in isolation.

MR. CHAMBERLAIN.—I think that the members generally are excusable for not furnishing statistics on wheels, for the reason that they do not have a chance to procure them. There are blanks that could be introduced on railroads without much trouble, from the use of which car-builders would be able to get the mileage of any wheels introduced by them. If every master car-builder will see, during the coming year, what he can do in that line, we shall have at the next meeting a valuable report. It is rather embarrassing to those who have not had as much experience in science as the master car-builders have had, to look over a report made by a committee of English civil engineers, who came over here some time in 1874, to investigate our system of railroads. I have here some English commentaries upon American railroad practice. I will read an extract from the paper of C. D. and F. Fox, read Nov. 24th, 1874, before the Institution of Civil Engineers of England, on the Pennsylvania Railway of the United States and American Railway Construction :

"The trucks of the engines have chilled cast-iron wheels. Steel wheels have been tried, but it was found that they would not bear the severe work of guiding the locomotive over the sinuosities of the line. Solid cast wheels with the running surface chilled, are the safest, especially in cold weather, a truck-wheel of this kind rarely breaking, and one such wheel outliving at least three steel wheels. Again, the flanges of chilled wheels are soon made smooth and highly polished by wear, while the flanges of steel wheels become rough and torn, and, in a short time, too thin and sharp for safety. Chilled cast wheels are also extensively used for the rolling-stock, steel tires having been tried for the passenger-cars, but have quickly become dangerous from rapid wear. The weight of a cast-iron wheel for a passenger-car is usually 525 pounds ; it costs about £4 sterling, and has an average life of at least 100,000 miles. The metal is charcoal-iron, having a tensile strength sometimes reaching 18 tons per square inch.

"In the discussion, Mr. C. D. Fox said, as to the question of cast chilled wheels, he had heard no difference of opinion, either in America or Canada. He was present when attempts were made to break up some of the wheels, and he was greatly surprised at their tenacity. It seemed more like trying to break wrought-iron than cast-iron. For wheels which, as in the case of the leading trucks, had to perform the duty of guiding the train, there was nothing, in the opinion of American managers, like cast-iron."

Probably Mr. Fox and those who were with him did not suppose that there was any other railroad in the United States except the Pennsylvania Central. I think if they had traveled over the country and inquired of some other railroads, they might have obtained a little different information from what they have here stated.

I have here a recapitulation of the mileage of 2204 iron wheels, and I think it is a correct statement ; nine different makers are represented.

Name of maker.	No. of wheels taken out.	Total miles run.	Least No. of miles run by any one wheel.	Greatest No. of miles run by any wheel.	Average miles per wheel.
A.....	824	32,764,167	9,432	89,447	39,762
B.....	593	19,959,526	3,224	97,324	33,659
C.....	312	8,714,337	3,003	82,368	27,931
D.....	270	8,148,877	7,963	76,329	30,181
E.....	108	3,376,480	10,062	73,710	31,264
F.....	80	1,307,928	1,360	45,630	16,349
G.....	6	48,728	5,577	9,305	8,121
H.....	6	141,034	13,728	37,484	23,506
I.....	5	68,081	11,437	15,740	13,616
Total.....	2204	74,529,158	.....	.....	33,815

The mileage of 102 steel wheels found defective and removed was as follows :

No. of wheels.	Total mileage.	Least mileage.	Greatest mileage.	Average mileage.
102	10,538,591	9300	251,416	103,321

The mileage of 138 pairs of steel wheels still in service, of which the least service of any pair has been 64,094 miles, and the greatest 228,113. Of six pairs which have been turned, the highest run before turning was 174,330 miles ; lowest, 62,834 miles. The highest run after turning has been 84,362 miles ; lowest, 49,550 miles ; highest total, 237,434 miles ; lowest, 129,048. Two pairs of wheels which have been turned twice gave the following results :

	Mileage before turning.	After first turning	Since second turning	Total
First pair.....	134,992	192,354	50,268	377,614
Second pair....	134,992	180,467	50,620	366,079

My wheel-book shows the cause of failure of every wheel, whether by its flange, by flattening, wearing out, or otherwise. I have a few more statistics of steel wheels, but probably it would be as well not to say any thing about them. The wheels referred to in my statement run under passenger equipment. I want you to understand that I am somewhat radical in regard to steel wheels. I can not give the average on wheels that are still running. We only figure up the average at the end of each month. The wheels that I am now going to call off are running, and, so far as we can judge, are likely to run for years to come. They are steel-tired wheels. Here are six which have made, respectively, 170,464, 107,554, 119,726, 204,982, 187,358, 129,379 miles; 92,000 miles is the smallest mileage that I have on the list. From that they run up to 100,000 and 175,000 miles. These are the mileages that have been made so far, and the wheels are still running. One pair made 134,922 before they were turned, and after the first turn 192,354 miles; after the second turning, 50,268 miles ; making an aggregate of 377,614 miles, and they are still running.

Another lot made before turning, 134,992 ; after the first turning, 180,467 ; after the second turning, 50,620; total mileage, and still running, 366,079. That is the highest mileage. We have them all the way up from 337,000 to a little over 400,000. Some of them have been running since 1870. I want you to understand, with regard to the failure of steel wheels, that the cause is known, and I can show you what it is. I suppose that I was about the first man to take an active part in introducing and looking after steel wheels, and consequently I have had some little reputation at stake. If there were frequent failures, I concluded I would be told that my judgment was not good, and I would have to get off the road, and therefore I have been very particular in getting information in regard to the failures, which amounted in all to 102. There are probably over 3000 steel-tired wheels running on the road I represent. The smallest mileage made by any one of them is 9300 miles, and the greatest of any one that has yet failed is 251,416 miles. The average is 103,325. The price of the wheels was, I believe, $50 each. With respect to the causes of failure, I would say that we probably do not all know how the steel is manufactured. The ingots that these tires are made out of were originally made by pouring the ingot into a mould. On breaking them it was found that there were little flaw-holes all through them. The ingot was hammered out while hot, and each and every one of these holes, instead of causing a round hole, made a seam. Consequently the steel was not perfect. No matter how solid the cast-iron was welded, it was imperfect, and so long as there was one of those imperfections in the steel, just so sure would they eventually give way. Every one of those wheels failed from that cause, although some made as high as 251,416 miles, while others made only 9300 miles. I had every wheel which failed broken up, and found this defect to exist in the steel, and the tire broke from that cause. That defect has now been entirely done away with. Ingots are now made as solid as can be, and perfect in all their parts. Last winter, while we were breaking 43 and 44 cast-iron wheels per month, we introduced steel wheels, and run them on the New-York and Boston Express line, and we have not yet had a failure, and some of them have run as high as 90,000 miles since that time.

MR. FORD.—What was the manner of breakage ?

MR. CHAMBERLAIN.—Sometimes the wheel, no matter whether the flaw was close to the edge or not, would break right off at that place. Sometimes a V-shaped piece would break out ; and others would scale on the tread. A scale about the thickness of a piece of paper would come off on the edge of the wheel. We could have turned them off and run them again, but did not, for we knew that the wheel, sooner or later, would do it again. There is something remarkable about steel wheels. No serious accident has ever happened because of their giving out on the road. You can find the injury quicker than you can in a cast-iron wheel ; and the steel wheels will carry you better after they are broken than a cast-iron wheel will, even when it seems to be perfect. This I know from practical experience. There is no guarantee. The maker does not wish to sell wheels unless the purchaser will pay enough to pay the interest on the money.

MR. S. F. GATES —I would like to ask Mr. Chamberlain his experience in regard to the breakage of wheels. In any experience that I have had in the breaking of steel, it has always broken wherever there has been a weak spot. Several years ago, the Boston and Worcester road had some steel rails, and one of them broke and threw off the car. I happened to be in Worcester at the time, and the company requested me to go over and see the rails and make an experiment with them. They had punched out on each side of the flange a place for a spike. The first blow from a large steel hammer would snap those ends off. After that they bent those rails in every direction, but they did not break again. I proposed to take the cold-chisel and nick a short distance back, and then see if they would break. The first blow on the rail after that nicking broke a piece out at that spot. The trouble apparently was that there was less continuous strength at the places where they had been nicked. The ingots are sometimes made unsound. The steel-maker should know just what the condition of the steel is before he makes the ingot. The very best grade of iron should be used in making the steel. If it is uniform, and there are no nicks in it, it ought to last a long time. The steel is very strong. The iron may have a tensile strength of 50,000 pounds per square inch, and the steel made from that iron has stood a tensile strength of over 150,000 pounds. You will always find in breaking a tire or wheel, that there is a weak spot somewhere. I have in the steel works picked out an ingot of iron and objected to it as being poor, and the superintendent of the shop has doubted what I told him in regard to it ; I would ask him to try it, and he would take the precaution to nick it with a cold chisel on all four sides, and it would break about four inches from his cutting ; but there was a flaw in the ingot before the breaking. An experienced steel-maker knows what his ingot is before he uses it. The cause of breakage in bars of steel is the vibration which is concentrated at one spot.

MR. CHAMBERLAIN.—I know positively that the ingots are now made perfect. I have seen fifty of them weighed, and they did not vary a quarter of an ounce.

MR. DAVENPORT.—In regard to the relative merits of iron and steel, I have taken some pains to inform myself upon the subject, and flatter myself that I know something about it. I have urged upon railroad companies the necessity of keeping a mileage record, in order that we might determine which were the best for actual service. You may not think that this is germane to the subject, but it is. If mileage records are not kept, the companies will be apt to buy the cheapest wheels they can get. Human nature is very much the same the world over, and men will be tempted to make cheap wheels whenever they can sell them at a good profit. But if railroad companies can be persuaded to keep an accurate mileage account of all the wheels they use, then we may hope that good wheels will be used instead of cheap ones. We have had a statement of the performance of wheels on the Boston and Albany road. Are we to conclude that this road had among the nine makers of its wheels the best makers of the country ; or are we to conclude that possibly they had some of those wheels that were made before the remedy for flaw-holes in ingots was discovered ? A railroad company, known to you all, has been giving this subject careful attention for the past two years. They have kept a mileage record, and I have been interested in examining that record, because I knew from the manner in which it was kept that the results obtained were correct. I find, from an examination made previous to the 1st of January, 1875, and which has been published over the official signature of the company, that the failed wheels showed an average of 50,000 miles. I mean by failed wheels, those that they have been called upon to replace. The wheels were in use by that company under their heaviest equipment, and were run at a very high rate of speed. A few of the wheels have made as high as 200,000 or 300,000 miles. These were not steel wheels, but only common cast-iron wheels, which, according to the record of my friend, only make an average of 33,000 miles. Yet, according to the careful records kept by this company—and I know of no company in the United States more accurate—these miserable cast-iron wheels have been guilty of making over 200,000 miles, and were going on to 300,000. I notice that the wheels of one maker—making 20 per cent of the wheels that have been taken out up to this time—have made an average of 50,000 miles, and some of them have already made a mileage record of about 200,000 miles; 80 per cent of them are still in use, and we do not know what mileage this 80 per cent will make before they fail. These wheels did not cost $50 apiece. They were wheels that cost $19 apiece, and when they were worn out, they were turned over to the maker for $9.50, thus making the actual cost to the company only $9.50 a wheel. This service, as I have stated, was under a heavy equipment, such as palace-cars and sleepers, which were run at the highest rates of speed. I know something about the use of the wheels of the same maker under freight equipment. Perhaps gentlemen have not considered the difference in performance between the passenger and the freight equipment. The average of the failed wheels of this make during the past six years was four years and a half, and the official statement of the mileage made was 27,500 miles per year. Thus the failed wheels had made a mileage of about 120,000 under the freight equipment, and 10 per cent only had failed ; the 90 per cent were still doing their work, and we do not know what report will be made

of that 90 per cent. Some of those wheels have already been in use nine years, and are still good. These are facts that have come under my own observation. There is as much difference between cast-iron wheels as there is between men. You may get a pair of cast-iron wheels that will be poor enough, and you may get a pair that will be good enough. Gentlemen must not judge the wheels of one maker by the performance of the wheels of another maker, for there is as much difference between cast-iron wheels as there is between steel wheels. I go in for improvement as strongly as any one, but I must protest against any attempt to impose upon us the belief that all the virtues are centred in the steel wheels, and all the vices in the cast-iron ones. I know that the performance of some cast-iron wheels is bad enough, but it is not fair to thrust those samples in our faces as the performance of *the* cast-iron wheels. If railroad companies will buy the best cast-iron wheels that can be made, and will pay the cost of production, and 10 per cent to cover contingencies—which, in many cases, I am sorry to say, they are not willing to do—we should have less complaint about the failure of iron wheels. I had intended to speak of the experience of a railroad company who have been keeping a mileage account, and have been testing steel wheels with cast-iron wheels. They had tested the steel wheels to their entire satisfaction—so the report said. I asked the company the result of their experiments, and I was told that they would not buy another steel wheel. I inquired what kind of a steel wheel they objected to, and they said the steel-tired wheel.

I think we should try to persuade our railroad officers to keep a record of mileage, and I think that when they do it carefully they will be surprised to find that there is as much difference in the performance of cast-iron wheels as there is in that of steel wheels. I am confident cast-iron wheels can be made that will give entire satisfaction at the smallest possible cost; but if you go in for a cheap wheel to begin with, you must take the consequences.

MR. CHAMBERLAIN.—I brought the statistics I have read to you to show what the different makers were doing, and I attributed the poor mileage of the cast-iron wheels to the fault of the makers. There are good, honest, true iron wheels made to-day, but they are few and far between. I have been accused of falsifying figures in regard to steel wheels, and of being interested in them, but I can assure gentlemen that my only interest and object is to get the best wheel for the least money. I think I have some pretty good mileage figures from the record, and that the results will compare favorably with any thing that the gentleman has shown in regard to iron wheels. I advocate the steel wheel because I think it is a good thing, and I think it is what we have all eventually got to come to. I think that the best cast-iron wheel manufacturers in the United States will finally come to it. There is a reform which we all need to help forward, and in which we can all do something; it is to aid the best cast-iron wheel manufacturers to run out the poor trash. I only ask that every wheel shall stand on its own merits.

MR. ADAMS.—I am inclined to think that the road referred to by Mr. Davenport is the Lake Shore road, although I am not positive about it. I was once engaged on one of its divisions, and therefore know something about the road. I have a circular that was sent me by the company, and if I remember rightly, the largest mileage reported was 50,000; but nothing was said in the printed list about extra mileage. The road has a foundry of its own, but it uses a great many wheels of other makers. These foreign wheels, I think, did not average 50,000 miles, while those from their own foundry averaged a little over 55,000. The wheels referred to as making over 200,000 miles are exceptional. The Boston and Albany road did not select poor iron wheels to run against steel wheels. The Washburn Wheel Company has a good reputation, yet it is not to be denied that they make some poor wheels. No maker can make uniformly good wheels; the chill is not always perfect, and there will be some soft spots. I do not wish to underrate iron wheels, but I believe steel ones are superior in every respect for passenger service. We have used them for five years, and know as much about them as any other road in the country. I have no idea that iron wheels are going out of use; they will probably be used under freight-cars for years to come. Nobody will pay $50 for wheels to put under these cars, with their small mileage as compared with passenger-cars. I have never known an accident caused by the breakage of a steel wheel under a passenger-car. An iron wheel breaks and we do not know why; but a steel wheel gives warning before it breaks. If a wheel can be produced for $50 that will run 400,000 miles, and save six or seven changes, besides insuring beyond question the safety of passengers, it seems quite clear that such wheels should be preferred. The managers of our road would not use steel wheels unless it was profitable to do so, and they are satisfied by experience and trial that they are better than iron. Mr. Reed, the vice-president of the New-York and New-Haven road, who never adopts any thing without a thorough test, has decided in favor of steel wheels, and requires them to be used under every passenger-car running over his road. I have no personal interest in this matter, and only desire what is best for the service. I have been told by Mr. Kirby that he could only get $26 a ton for old iron wheels, and that the Lake Shore road has hundreds of them they would like to sell; while we can get $25 for every steel wheel that fails. This may be a surprise to you, but it is a fact.

MR. HOLMES.—Some reference has been made to the flat spots which come upon the wheels, and that they come when no brake has been applied. I would like to ask whether they occur on the same place upon both wheels upon the same axle, and also whether those wheels were of the same calibre. That is a point which, I think, has been overlooked in this discussion. I hold that both wheels of an axle should be of the same calibre exactly, and then you would have no trouble with the flat spots.

MR. ADAMS.—That is a very important consideration. I presume that the facts are as inferred, that the wheels are of different diameters. We know that wheels are occasionally broken because they are not calipered as carefully as they should be. And here is another advantage from the use of steel wheels. They can be turned perfectly true. It can be ascertained beyond question that they are exactly the same in diameter. There is another merit in steel wheels which has not been alluded to. In 3000 or more that we have in use on our road, we have never yet discovered a single indication of a flat spot; and we are obliged to use brakes in going down our hills, and we run at about as high a rate of speed as they do on the Western roads. We make one hundred miles and six stops in three hours on three or four trains every day over our road. There is another thing about steel wheels to which I must refer. We have never yet discovered that any of them wore at the flange.

MR. HILDRUP.—I have been a wheel-maker for twenty-five years, and I think I know something about it which may be of interest to the Association. I make wheels for my own cars, and I try to make the best I can. I make them of cast-iron, but am not yet quite satisfied with the result. As we have not the time now to go into this discussion as fully as its importance demands, I hope it will be arranged so we can have an opportunity to discuss the subject more fully at the next annual meeting.

MR. S. W. MYERS.—I would like to inquire whether steel wheels wear the rails more than iron wheels do?

MR. ADAMS.—I can not say definitely, as that is a matter which has not come under my observation; but I think I would have known it, had such been the case.

MR. HOPKINS.—I would suggest to the committee on this subject, that it be ascertained by actual experiment, whether a car with steel wheels pulls harder or easier. I would also suggest a plan of inspection of cast-iron wheels which I have found exceedingly useful; and that is, by examining the wheels by getting under the car and looking at the plate on the inside of the wheel in order to discover whether it is cracked or not. I have, during the past winter, discovered seven cracked wheels by that means, where the hammer failed to give the slightest indication of a crack. As an experiment, I once ran a wheel cracked in that way from Paterson to Buffalo and back twice, going with the car myself and watching it at every station. It was run on a way-train. I know, therefore, that those cracks can exist for a considerable time without discovering themselves by the use of the hammer. My own observation satisfies me that a crack in a cast-iron wheel can always be discovered a good while before the wheel fails. I am satisfied that cast-iron wheels do not fail all at once.

MR. ADAMS.—Are there not apparently a great many cases where they have failed all at once?

MR. HOPKINS.—I have never known such a case where this system of inspection was adopted.

MR. WIERS.—We had four broken steel wheels under our cars last year, two under Pullman cars and two under passenger-cars. Our president ordered me to get those steel wheels a year and a half ago. The first wheel ran about two months. One of the inspectors knocked a hole in it with the hammer. We found a flaw inside of it. We took that one out, and then we found another wheel that was cracked right through the tread. One of the Pullman cars broke the wheel near a station; the break was close to the flange. Thus we have had four steel wheels to come out from under our cars within a year.

On motion, the discussion was here closed.

THE PRESIDENT announced Messrs. John Kirby, I. W. Van Houten, and W. E. Chamberlain, as the Committee on the subject of Car-Wheels, etc., for another year.

BRAKES.

The Committee on Brakes presented the following

REPORT.

To the Master Car-Builders' Association:

GENTLEMEN: Your Committee on Railway-Car Brakes respectfully beg leave to report that, owing to the very full and exhaustive reports tendered in the years 1873 and 1874, they have not had the matter at their service to make an extended report for the present meeting. This is due to the fact that during the past year the Vacuum Brake has passed into the hands of the Westinghouse Air-Brake Company, and consequently depriving us of any competitive tests that have heretofore furnished the Association with much useful and interesting information. From all the information we have been enabled to procure, we find that there have as yet been but two devices that have proved serviceable and reliable as train-brakes—one by the use of compressed air, and the other by means of a vacuum.

In the former case we find that compressed air, when used in what is known as the automatic brake, places the train, not only in the power of the engineer, but under the control of the train hands, thus making it the most serviceable of the two forms.

The Loughridge air-brake is in use on a number of trains, and, so far as we can learn, is giving general satisfaction; but we have received no official information regarding tests, etc., from the Loughridge Company. A full description of this, as well as all the other leading railway brakes, has already appeared in the preceding reports of this Committee.

Your Committee would recommend the members of the Association to urge upon the officers of the roads they represent, the necessity of using a power train-brake such as will give both engineer and train hands control of the train, being fully satisfied from results exhibited in almost daily reports, that it will save its cost many times in averting accidents that would result in loss of life and the destruction of much valuable property. It has already been fully demonstrated by keeping accurate accounts, that a very large saving is attained in the use of such a brake in the wear of rolling-stock. This being true in the case of passenger equipment, it must doubtless be true in freight equipment, and its adoption on freight-cars is only a question of time.

Your Committee concluded to defer sending circulars this year, as there was no information that was of any benefit that we had not already reported upon fully, and deemed it expedient that it would be more profitable if a greater amount of time be given to the discussion of the subject at the present meeting, in order to develop new subject-matter for the Committee to work upon. Your Committee would also suggest that in the course of the discussion the members present questions that may suggest themselves, relative to the subject, and not already acted upon. By so doing, much additional information may be obtained that would prove interesting and instructive.

We realize the great importance of the subject committed to our care, and desire to keep the Association informed of the various devices as they are presented to the public.

G. W. DEMAREST, }
GEORGE HACKETT, } *Committee.*

Report read and accepted.

SIZE AND FRAMING OF FREIGHT AND PASSENGER CARS.

MR. DAVENPORT, from the Committee on the Size and Framing of Freight and Passenger Cars, presented the following

REPORT.

To the Master Car-Builders' Association:

GENTLEMEN: Your Committee beg leave to present the following report: We sent out 600 circulars asking the members of the Association to send tracings embodying their ideas of the best plan and size for passenger and freight cars, said tracings to be kept on file for reference in the rooms of the Association. Twelve tracings have been received, and are kept in a convenient book-file for use of members. Your committee, in compliance with your instructions, have had drawings made, which we herewith submit, embodying our views of the best sizes and styles of framing for passenger and box cars for ordinary use. In the circulars sent out, five questions were propounded We have received replies from only 18 members. Analyzing the answers to these questions, we get the following results:

1st Question. "Have you box freight-cars on your road more than 30 feet long? If so, how are they framed and trussed, and have they given good satisfaction?"

Eight answer that they have; three say they are satisfactory; three say they are not; none give any novelty in trussing; ten say they have *none.*

2d Question. "Do you think it would be economy for railroad companies to have their freight-cars longer than 30 feet, and so constructed as to carry a load of 15 or more tons?"

Six answer Yes ; two of them specify "if on long lines;" twelve answer No, being opposed to long cars, except for special traffic, such as cotton, hay, lumber, etc.

3d Question. "In your opinion, would there be objections to carrying 15 or more tons upon an 8-wheel car, provided the car is capable of carrying that weight ?"

Thirteen answer that they have no objections to carrying 15 tons on 8 wheels, provided the journals are large; five are opposed to carrying over 10 or 12 tons in a car. The general impression seems to be that the M. C. B. standard axle is amply strong for this heavy service.

4th Question. "Can you make a good substantial box freight-car capable of carrying 15 tons, that will weigh 15,000 pounds ? If not, how much more should it weigh ?"

Fourteen answer that they can not ; that a car suitable for such heavy service must weigh 18,000 to 20,000 pounds ; four think they could build cars strong enough that would not weigh over 15,000 pounds.

5th Question. "Would the officers of your road entertain the idea of a national car, duplicate in all its parts, except wheels and springs ? The plan of such a car to be chosen from a sample car selected from one designed and built by each railroad company, such selection to be made by the officers of the railroad companies ?"

Nine answer that they would ; nine think they would not. It is noticeable that those who favor a uniform national car represent the roads forming the through lines, while those opposing it are principally from roads doing local business chiefly. Some oppose the idea of a national car on the ground that it would stop all improvement in car-construction. Your Committee respectfully suggest that if it would stop the endless multiplication of styles of cars, on the plea of improvement, thus saddling the railroad companies with greatly added expense in repairs, it would be a blessing which the stockholders would appreciate.

By referring to the plan recommended by the committee, you will observe that a car 29 feet long is thought to be the best for ordinary traffic, while for hay, lumber, etc., 34 feet in length would seem to be most desirable. Both sizes to have a carrying capacity of 15 tons, thus utilizing the increased weight of rolling stock and decreasing the proportion of dead weight to paying freight.

About 40 models of the side-framing of cars of various lengths were submitted at the monthly meeting held at the Association Rooms, in this city, March 18th. The tests excited very deep interest, and developed some surprising results. Your Committee regrets that in those tests the difference between the sustaining power of cars sided lengthwise and those sided vertically, both being framed alike, was not brought out. We trust such tests may be made during the sessions of this Convention, as we believe a great difference exists, and that it is very important to be understood without delay.

In regard to the framing of passenger-cars, the best size, etc., very little information has been obtained. We submit drawings for your consideration, and have placed them on file for your reference. We have received but one model of the side-frame of a passenger-car, which is exhibited here. You will be impressed with its strength, if you should not think it as light as is possible to build.

All of which is respectfully submitted.

W. R. DAVENPORT,
E. A. OLMSTEAD,
H. A. WEBSTER, } *Committee.*

MR. DAVENPORT.—A number of the models which you see here for framing cars were submitted to the Stevens Institute of Technology and very thoroughly tested. This could not be done at the rooms of the Association. A report of the test has been handed to me. It is impossible, owing to the lack of time, to hear that report. I think that the thanks of the Association are due to the gentlemen who have so kindly made the tests without expense to us, and have furnished us with the detailed report.

On motion, a vote of thanks was unanimously tendered to the Stevens Institute of Technology, and especially to Professors Thurston and Wood, and the students who made the report, for the interest taken by them in the Association, and for their kindness in testing without compensation the materials and models furnished them.

MR. FORNEY.—I am glad that this matter of car-framing has come before us in the way it has. It is a very important subject, and can not only be discussed but carried into practical effect by the members of the Association if we can only decide which style of framing is the most desirable. I do not feel that we are prepared at the present moment to determine what shall be the style recommended by the master car-builders for adoption, but it does appear to me that our ideas in reference to this matter must be very much awakened. Our thoughts must be turned to this subject more than they have ever been before, and our efforts must result in good. I believe that the tests which have been made are very largely to be relied upon, coming as they do from those who have had every facility for making the tests, and who have had a thorough experience in regard to the matters which bear upon the proper framing of cars. I think that we ought to place a great deal of reliance upon their reports ; and I hope that there will be a free discussion of this subject, not only at this meeting, but that it will be laid over to another meeting, and valuable information brought before us at the next Convention. In this report one model was spoken of as being tested, about which perhaps I am more familiar than with any other style of framing to which the attention of the Association has been called. It is the model furnished by Mr. Smith, of the C. C. C. & I. R. R. A large number of cars framed in that way have been running for years ; and I am free to say that they are in my judgment the best framing, for the size of the car, that I have had any experience with. Undoubtedly other members have confidence in other methods of framing. The way for us to get at the best method is to have a free expression of individual views. The main point to which I refer in this particular model, is the method of putting in the iron trusses. They are put in on an angle running from the plate over the bolster, down through the sill toward the centre. The model is here, and I trust the members will take interest enough in the matter to examine it in connection with the others.

MR. HILDRUP.—To make this discussion thoroughly understood, I think it would be advisable, in speaking of the styles of framing, to refer to the models which are here, as far as possible. I confess that I am very much in the dark on this subject. I know the styles of framing adopted by several railroad companies, although I am not acquainted with the particular plan under discussion.

MR. CHAMBERLAIN.—I brought some models here expressly to be tested by the Professors of the Stevens Institute. They represent three different styles of framing. The first one is a frame without any iron underneath the post or brace. This has yet to be tested. The second one is framed differently from the first, with iron underneath the braces. The third one is ironed underneath all the posts and braces. In addition to these I have a model of each kind with the boarding up and down, and one with the boarding lengthwise ; so that by testing the models first without any covering on, and then testing each style with the covering, we shall probably be able to get the result of the different strains on the car by the different methods of boarding.

A MEMBER.—Have they inside lining as well as outer covering ?

MR. CHAMBERLAIN.—No, sir. On the covered ones the advantages are exactly alike.

MR. KIRBY.—No ; not exactly. I will explain why not. If you put your inside boarding on, and it runs the same length as that outside, then you have a reverse boarding.

MR. CHAMBERLAIN.—It is the same in both cases, as I understand it. If you give additional advantage to one, you give it to the other. By putting inside boarding on both of those models, we shall get precisely the same results. Boarding the inside of both of them does not give either one any advantage over the other. What I want to find out is how to board a car the strongest with the least amount of material.

After some further discussion, a report of which would be unintelligible without a representation or drawing of the various models referred to, the President announced that the time had arrived for

RECEIVING AND ANSWERING QUESTIONS.

MR. HILDRUP.—A question has suggested itself to me repeatedly during the sessions of this Convention, and I would like to ask it now :

How far are the general repairs of cars in use increased by the want of proper inspection, resulting from the want of a proper force for inspecting ?

My observation of the operation of railroads is, that the repairs are double what they should be if these matters were properly attended to. I may hit some of my neighbors in such a suggestion, but they are all my friends, and they will not take any thing as personal. I have a kindly feeling for them, and I think that they have for me. The train by which I came here was on a first-class railroad, and the company claim to run the road in number one style, but I must say that if I were to attempt to run a car-factory in that style, I would fail just as sure as I made the attempt. I could not keep it up one year before the sheriff would sell me out. This company had inspectors stationed to inspect the train. The inspector ran along, hit a wheel, dodged from one to another like a humming-bird from flower to flower. It was done so rapidly that nobody could be any the wiser for the inspection. Nobody could tell from such an inspection whether the waste was in its proper place and in sufficient quantity, or whether it was composed of a ground-up mixture of dust, mud, and oil. No piece of machinery can be properly dealt with in that manner. If waste is valuable in a box, we should see that waste is used. We know that a certain amount of oil is requisite, but we do not consider it requisite to the successful running of a railroad that the track should be greased from end to end. Oftentimes, on inspection, you will see a nut loose, which, if properly screwed up at the proper time, will prevent damage, but if attention is not given to it we can not tell what the result will be. I do not wish to discuss this question, but merely to lay out the ground-work. I only wanted to inquire whether you gentlemen who live around railroads are able to see what occasional travelers discover.

MR. FORNEY.—I would like to ask how, if the train is stopped only five minutes, an inspector can be expected to do his duty any differently ?

MR. HILDRUP.—I do not want to be placed in that position. The inspectors are among my friends. I have not a word to say against them, but I do claim that there is a secret in regard to railroads that we all know, but with which the public generally are not acquainted—that the mechanical forces are held responsible for certain results, but that proper provision is not made for them in order to best secure those results. I am not now reflecting upon the master-mechanics or the inspecting forces. They are shrewd, bright, quick, energetic men whenever they have an opportunity. Perhaps they have to put into fifteen minutes' time what they could not do justice to in half a day. If trains were regulated and run upon the principle that "a stitch in time saves nine," we should have fewer breakages and accidents. I claim for cast-iron that it is an honest, reliable, trusty material, when used in a proper way ; that it will not break instantaneously, but will give you warning. If proper supervision was given to a train, these defects could be discovered before any breakage occurred. The system of railroading must be readjusted in order that the machinery may have proper supervision. I believe that one half the general repairs would be avoided if this was done.

MR. GRIFFITH.—I think the gentleman must be speaking of the inspection of trains at way-stations on short stoppages. It can not be possible that an inspection at the end of roads or at shops would be carried on in this hurried and careless manner. I would like to ask the gentleman whether he has reference to the inspection of trains at the end of the road or at way-stations ?

MR. HILDRUP.—The railroads are all my friends, but I do believe that a little friendly criticism will be good for them. Let me tell you something else I know. When a railroad finds the receipts falling off, the business getting slack, and they feel the necessity of economizing, they commence, perhaps, by reducing the number of hours for their working force. If that does not reach the percentage of economy that they want, they cut off one day in the week. They do not lessen the number of trains run. They calculate to run on the strength of the material—on its good character. They think they economize by lessening their force and putting their machinery through on its honest character for wear and tear. As practical men, we all know that that is a serious error. Let us willingly accept, as mechanics, all the responsibilities that belong to our position, but let us not willingly accept for ourselves responsibilities that do not belong to us.

MR. WARD.—This hurried inspection is gone through with because of the limited time given. For instance, at Harrisburg, on the Pennsylvania Railroad, we have four or five shifts of trains to make from as many different tracks, and this shifting and the inspection must be done in ten minutes. We all know, as practical men, just how that work should be done, but we know that it can not be properly done in so short a time.

MR. HILDRUP.—I want to say again that I am not reflecting upon the inspectors. Mr. Ward is one of our most experienced inspectors. He is a diligent, attentive, watchful man, and I have no criticism to make against him or any of his force. I am simply speaking about railroad policy, and am not reflecting upon anybody. There are responsibilities connected with the running of railroads that are sometimes very embarrassing, not only to the mechanical forces, but to the officers themselves.

MR. STEWART.—As to the inspection of cars, I wish to say that I have passed through the thing from the commencement, and my practice has been to do the best I could in the time that was given. If I found any thing the matter, I would make the repair, or report it, or take the car out.

PLACE OF NEXT ANNUAL MEETING.

The Committee on this subject presented the following

REPORT.

To the Master Car-Builders' Association :

GENTLEMEN : Your Committee, to whom the subject was referred, have consulted with a number of members, and would recommend that the next annual

meeting of the Association be held in the city of New-York, for the following reasons: That a majority of the members will desire to visit the Centennial Exposition at Philadelphia, where it will be very difficult to obtain hotel accommodations. These can readily be obtained in New-York; and the facilities are such that the Association, as a body, can readily visit Philadelphia from here.

B. K. VERBRYCK,
GEORGE HACKETT,
D. C. RICHARDSON, } *Committee.*

On motion, the report was adopted.

THANKS.

The Committee on Communications reported the following resolution, which was unanimously agreed to:

Resolved, That the thanks of this Convention are hereby tendered to the merchants, manufacturers, and others of New-York and vicinity, for the liberal and hospitable manner in which they have entertained the members of this Association during their stay in this city; for their consideration in ministering to the enjoyment of the ladies who have accompanied members, and for the ample facilities which they have provided for visiting various places of interest and amusement while here.

FUTURE HOSPITALITIES DECLINED.

MR. C. A. SMITH offered for adoption the following preamble and resolution:

Whereas, the practice of entertaining the members of this Association, by its friends, has become an established custom, and has thus assumed somewhat the character of an obligation to which those who have so generously dispensed hospitality have, in a measure, felt themselves obliged to conform; and whereas, the expenditure of time and money for this purpose has in many cases been very much greater than the members of this Association have the right to expect should be devoted to their enjoyment; and whereas, the expense of such hospitality has in some cases been interpreted as having a significance which has been the cause of embarrassment to members; Therefore, we desire by this resolution, first, to express our thanks for the liberality of our friends in the past; and secondly, to make the request in this public way, that in the future there shall be no more expenditure of money for the public entertainment of members of this Association.

MR. DAVENPORT.—I second the resolutions.

MR. VAN HOUTEN.—I think the resolutions are of such a character as to require no explanation, but still it may be necessary to say a word. This is a matter that I have thought of for some years past. I have looked upon the matter of public entertainment as being a great injustice toward our friends, as an occupation of their time and an expenditure of their money entirely uncalled for. The practice of accepting hospitalities has been, in my opinion, to a certain extent detrimental to the best interests of this Association. I believe the impression has gone abroad that the master car-builders, in their annual meetings in the large cities, assemble for the purpose of having a good time, and that too much time was devoted to this matter of entertainment. We meet for a certain purpose, and that purpose is a good one. We should first attend to the business of the Convention; after that is done, those who feel desirous to do so can at once return home, while those who wish to remain and have a good time can do so, not at the expense of our friends, but at their own expense.

MR. HOPKINS.—I am exceedingly glad that this resolution has been introduced. This Association, I think we may safely assert, has some influence on the commercial prosperity of the nation. It will in time, I trust, have an influence far beyond any thing that the members now anticipate. With all the responsibilies, humanitarian and pecuniary, which rest upon this Association, we can not afford that there should be the slightest chance for suspicion with regard to the integrity of any of its members. I do not believe that a single member would accept of any hospitality, directly or indirectly, in a corrupt sense. They accept it only as evidence of goodwill to the Association and to the cause it is striving to serve. But at the same time, since the impression has gone out that it is possible that these hospitalities have been accepted from improper motives, I am extremely glad this resolution has been introduced, and I hope it will be adopted.

The preamble and resolution were then unanimously adopted.

SUBJECTS FOR NEXT ANNUAL MEETING.

The Committee on this subject submitted the following

REPORT.

To the Master Car-Builders' Association:

GENTLEMEN: Your committee, appointed to present subjects for discussion at the next annual meeting, would report that the subjects of Heating, Lighting and Ventilating Passenger Cars; the Best Remedy for Hot Journals, etc.; and Draw-Bars and Buffers, have by your action been continued another year, and a committee has been appointed to report on a System of Accounts for Car Repair Shops. They also recommend that the present committees either be continued, or new ones appointed, to report next year on the "Best Style and Most Economical Truck for Freight-Cars"; "On the Framing of Cars"; and "On Car-Wheels." They would also recommend that a committee be appointed to "Describe and report all improvements made in the Design, Construction, or Material used for cars during the coming year."

W. W. WILCOX,
M. N. FORNEY,
W. C. CHAMBERLAIN, } *Committee.*

MR. ADAMS.—Before acting upon the report, I would like to say a word in regard to a suggestion that has been made that members furnish models of wood or iron, when possible, to illustrate subjects under consideration. No doubt, many of us can convey our ideas in that way more satisfactorily to ourselves, than by presenting a written report. If any member has an idea which he thinks is new and would be valuable, let him make it known to the Association through a model. Bring forward as many models as you can, whether of trucks or car-bodies, or what not. They will be of interest and of value to the Association. I would suggest an addition to the report of something like this: "That the several committees be directed to request members, so far as practicable, to illustrate their ideas by models."

The motion of Mr. Adams was agreed to, and the report adopted.

MR. HOLMES.—I move, in addition, that there be a committee appointed for the purpose of making a report upon Elliptic, Combination, or such other Springs as are used in our passenger-cars. Carried.

COMMITTEE ON IMPROVEMENTS.

The CHAIR announced the following gentlemen as the Committee to decide and report upon all improvements made during the coming year in the Design, Construction, or in the Materials used in Cars: Messrs. M. N. Forney, W. D. Hildrup, and W. W. Wilcox.

HISTORY OF THE ASSOCIATION.

THE PRESIDENT.—I have been desired to ask this question:

At what time and place was the Master Car-Builders' Association organized, and where have their annual meetings been held?

MR. CHAMBERLAIN.—I can give you a little information on that subject. Informal meetings of the Master Car-Builders were held in Buffalo, New-York, West-Albany, Adrian, Mich., and Springfield, Mass., on the 15th of May, 1867. At Springfield, a committee was appointed to draft a constitution and by-laws. The first annual meeting was held in Utica, September 18th, 1867; the second, at Dayton, O., June 10th, 1868; the third, at Chicago, June 9th, 1869; the fourth, at New-York, June 8th and 9th, 1870; the fifth, at Richmond, Va., June 14th, 1871; the sixth, at St. Louis, June 12th and 13th, 1872; the seventh, at Boston, June 11th, 12th and 13th, 1873; the eighth, at Cincinnati, June 10th, 11th and 12th, 1874.

THE SIZE AND FRAMING OF CARS.

The Convention then resumed the consideration of the size and framing of freight and passenger-cars; but a detailed report of what was said would be to a great extent unintelligible, for the reason that reference was constantly made to the various models on exhibition, and their peculiarities of construction. Some of the points, however, may be indicated.

MR. FORNEY referred to the fact that designers of bridges had ascertained by experiment that an angle of 45° was the most suitable for braces, and secured the greatest strength. He thought the same principle would hold good with regard to cars.

MR. HILDRUP objected to cutting the braces when it could possibly be avoided. He preferred to have the siding put on lengthwise, as this method gave the car greater strength. It was necessary to consider that two conditions must be provided for, namely, the ability of a car to carry a load safely while it remained in its proper position on the track, and its ability to resist concussions and strains when thrown from the track or down embankments. A car might be made so light as to be well adapted to the first-named condition, but very unsuitable for the latter.

MR. GRIFFITH thought it was an error in the old method of construction to cut the intermediate and side-sills where the bolsters crossed them, as it made the sills liable to split and break. In regard to end-sills, he was now making them 8x8, which might be considered heavy, but in case of collisions they were less likely to give way than if made lighter.

MR. KIRBY said he notched the sills and floor-timbers about half an inch, just enough to form a good shoulder for the draw-sticks. He put a ¾ inch rod through the dead-woods and running back through the transoms, so the draught was not altogether on the bolts which hold the draw-sticks to the floor-timbers. He made bolsters 5½ inches by 12. He had not much to say in favor of horizontal boarding, as it let the rain into the joints and caused the sills to rot. It also made trouble where the doors of the car were rabbeted and notched into the corner-posts.

MR. GRIFFITH said he let the siding run from the corner-posts both ways, meeting at the corners, thus making an even finish at the end of the car, and avoiding the liability to split where the rabbet is. In regard to the door-posts, he made a rabbet in them of 1½ inches, and drove the nails alternately, one close up and the next further back, so they would not be in a line, and thus cause splitting.

MR. SNOW, in response to an inquiry as to the comparative utility of wood and iron bolsters, said his road—the Illinois Central—used iron ones altogether, making them of ¾x6 inch iron, with an arch of not quite six inches in the centre—the draw-timbers running through the arch.

MR. L. GAREY thought it was impossible for a wooden transom to carry a centre-bearing for any length of time without using at least half as much iron as would be required for an iron transom. He did not consider an iron transom fit to be used unless it was welded up at the ends.

MR. CHAMBERLAIN had never seen a wooden transom, or one of wood and iron combined, that would do its work successfully. He had seen them constructed in various ways—of 4 pieces of timber and of 5 pieces of iron—and yet the floor would go up. One trouble was in getting dry timber. He was now using a double iron transom, the two placed four feet apart over the centre-pin; this prevented forward sagging, which was a very common thing since the introduction of the Miller platform.

MR. LEIGHTON did not disapprove of iron transoms, but at the same time he thought just as good ones could be made of wood. He used Connecticut white oak, 5½ inches thick and 15 inches wide; notched out the under side of sills ½ an inch and about the same on the transoms, and bolted them together; run four one-inch rods over the two centres through the intermediates and out through the ends of transom, with nuts on the outside. He had also made transoms of three and four pieces of timber, and sometimes with four pieces of iron bolted in between, and these had invariably gone up. He had crowned the irons and put them in crown down, with two rods over them in addition, but still the bolsters would go up. The wooden ones, however, did not crown up, and he had been putting them into cars for the past three or four years with entirely satisfactory results.

MR. SNOW had had trouble with double transoms on Pullman cars, but had obviated it by cross-trussing.

MR. HILDRUP said his impression was that iron bolsters cost about $13 per car more than wooden ones. His experience of twenty-five years as a car-builder led him to favor iron in preference to wood, although he did not question the excellent qualities of white oak.

STEVENS INSTITUTE OF TECHNOLOGY.

MR. FORNEY offered the following resolution, which was unanimously adopted:

Resolved, That the members of the Master Car-Builders' Association hereby instruct their Secretary to communicate in writing their thanks to the Trustees and Faculty of the Stevens Institute of Technology, for their very polite invitation to visit that institution, and for the hospitable reception given to those who accepted the invitation. They also desire to say to the gentlemen who represent that institution, that the members of the Master Car-Builders' Association have been impressed by their visit more than ever before, that if they expect to advance in their occupation at the same rate at which all other arts are progressing, they will be obliged more and more to seek the assistance of science, and the co-operation of those who devote their lives to its study. They also wish to express their thanks for the very valuable assistance which members of the Faculty of said institution have so generously contributed to this Association during the past year whenever their aid has been sought.

OFFICIAL REPORT.

On motion of MR. FORNEY, it was resolved that the official report of the proceedings of the Convention, when it shall be published in the usual pamphlet form, shall be offered for sale at such price as may be agreed upon.

SUNDRY COMMITTEES.

On motion of MR. FORD, the Committee on the Size and Framing of Freight and Passenger-Cars was continued another year.

THE PRESIDENT appointed as the Committee of Ar-

rangements for the next annual meeting, Messrs. C. A. Smith and Willis Davis.

THE PRESIDENT, in pursuance of a vote of the Convention authorizing him to designate the members who constitute the committee on the Dictionary of Terms, announced that such committee consisted of the Officers of the Association and Mr. M. N. Forney.

THE PRESIDENT appointed as the Committee on Car-Springs, Messrs. B. K. Verbryck, C. E. Garey, and D. C. Richardson.

OFFICERS FOR ENSUING YEAR.

MR. SOMERBY, from the Committee appointed to present the names of officers of the Association for the ensuing year, made a report recommending the following gentlemen respectively for the offices named :

For President,	LEANDER GAREY,
" *Vice-President,*	M. P. FORD,
" *Secretary,*	C. A. SMITH,
" *Treasurer,*	A. STEINBACH.

Messrs. Somerby, Hildrup, and W. F. Smith were appointed as a committee to cast the vote of the Convention for the offices above named. Messrs. F. D. Adams and Willis Davis were appointed tellers. After balloting, the gentlemen above named were declared to be unanimously elected to the respective offices to which they were nominated.

The Convention then adjourned.

Trial of Continuous Brakes in England.

A SERIES of trial-tests have recently been made in England, for the purpose of ascertaining the comparative merits of continuous train-brakes. The experiments were made on the line of the Midland Railway, and under the auspices of the Railway Companies' Association of England. The most thorough preparation was made with the view of insuring a fair competition, and the trials were continued nearly a week. The competing trains were equipped with the following brakes :

1. Fay's Continuous Brake, a device long in use. Each carriage has a shaft passing from end to end, and on which is a screw which actuates the brake levers. The shafts are coupled up between each pair of carriages by a square bar, one end of which carries a coupling, while the other slides in a socket forming part of the shaft beneath one of the carriages. The coupling-bars thus transmit the rotary motion from one shaft to the other, while the sliding movement of the bar in the socket allows for the play of the buffers.

2. Clark & Webb's Chain-Brake, which is applied by tightening a chain attached to a drum beneath the van, and so mounted that it can be driven, if desired, by bringing it into contact with a friction-wheel attached to the van axle. It is not adapted to long trains, and when used on them has to be worked in sections.

3. Barker's Hydraulic Brake, in which water under steam pressure is forced into pipes extending through the train. The water is supplied from the tender and worked by a plunger in connection with a cylinder fitted with a piston.

4. Clark's Hydraulic Brake, actuated by a cylinder on each carriage, four or six inches in diameter, the water being forced into pipes by a plunger worked under the foot-plate of the engine.

5. Steel & McInnes's Air-Brake, consisting of vertical cylinders at each end of the carriage, connected with two lines of pipes extending through the train, and which also communicate with a reservoir on the tender charged with compressed air. Under normal conditions, the pipes and the cylinders are similarly charged, the latter upon each carriage being fitted with a piston, the rod of which is connected with a bell-crank underneath, from which the brakes are applied to the wheels by tension-rods.

6. Smith's Vacuum Brake; 7. Westinghouse Vacuum Brake; 8. Westinghouse Automatic and Continuous Brake; the construction and mode of operation of which are well known to railroad men in this country.

The results, as indicating the relative practical efficiency of the competing brakes, are summed up by *Engineering* substantially as follows : Of the mechanical brakes, Fay's, although capable of making good stops when properly adjusted, is not generally available, on account of its cost and its unfitness for use on trains that have to be frequently broken up and remade. Clark & Webb's brake does not appear to be suitable for main line traffic ; when used on trains that are kept constantly made up, it works well and makes prompt stops, but it subjects the vehicles, and particularly the draw-bars, to severe strains. It is probably as perfect as the chain-brake system will admit ; but the system itself is not likely to come into general use. The two hydraulic brakes, Clark's and Barker's, are identical in principle ; they have a fair promptness of action, but are liable to get frozen up in winter when fresh water only is used, and they can not be made available automatically in the event of a break away.

With respect to the air brakes, the Vacuum is a simple form of brake, and under certain circumstances an effective one; it is, however, very far from fulfilling the numerous conditions a continuous brake ought to satisfy. Of the two vacuum brakes, we ourselves prefer the Westinghouse. The india-rubber collapsing bags, used in the Smith brake, we consider very much inferior to cast-iron cylinders, both as regards durability and liability to accident. The exhausters fitted by Mr. Smith to his brake vans, and driven from one of the van axles, no doubt do some good during the early part of each stop by emptying the pipes quickly; but considering the small number of revolutions which can be made by each exhauster during a moderately prompt stop, and the leakage which takes place in all exhausters when driven at a low speed, the value of these contrivances certainly can not be regarded as likely to be high in general practice. Neither of the vacuum brakes, we may add, is of any practical use in the event of a break away ; while neither can be applied from the rear without the use of the unreliable cord arrangement.

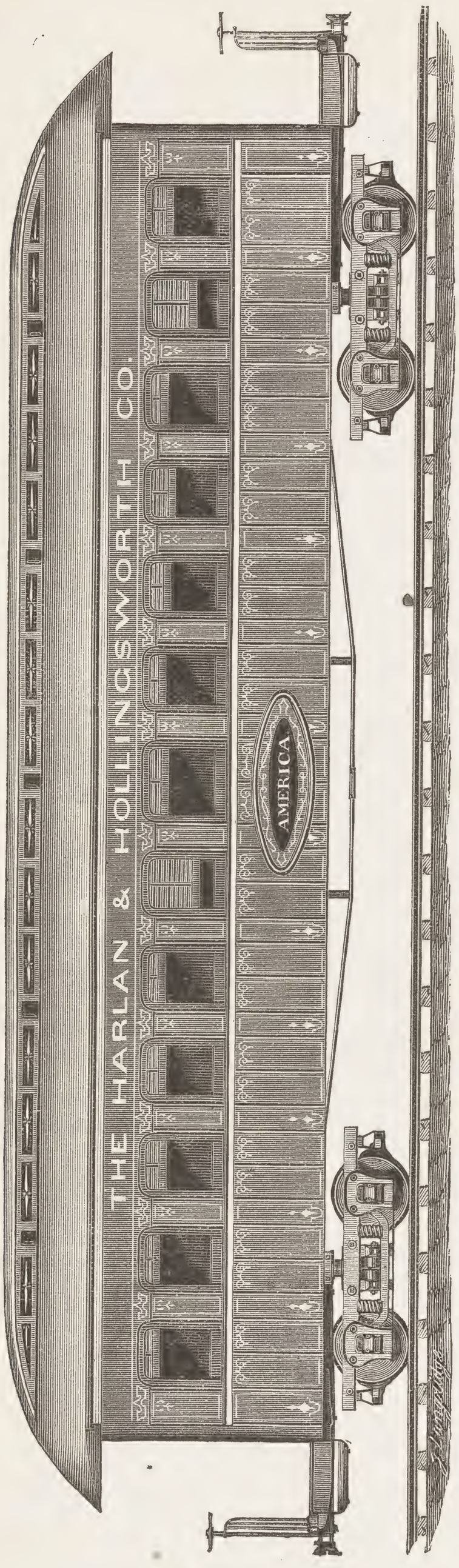
The Steel & McInnes brake is one which we can not help regarding as more perfect in theory than in practice. The idea of carrying a store of compressed air in each carriage, and applying the brakes by relieving the pressure in the connecting pipes, is undoubtedly good, but the means of carrying it out appear to be faulty. The arrangements are especially such as to lead to great, and we fear unavoidable, leakage, while they also fail in giving that promptness of action which is so essential to the efficiency of a continuous brake. The brake, of course, acts automatically in the event of the breaking away of a train, while it can also be applied from the rear or from an intermediate carriage, and so far it forms a step in advance of most of its competitors; but the practical defects we have pointed out constitute objections which we fear it will be difficult to overcome.

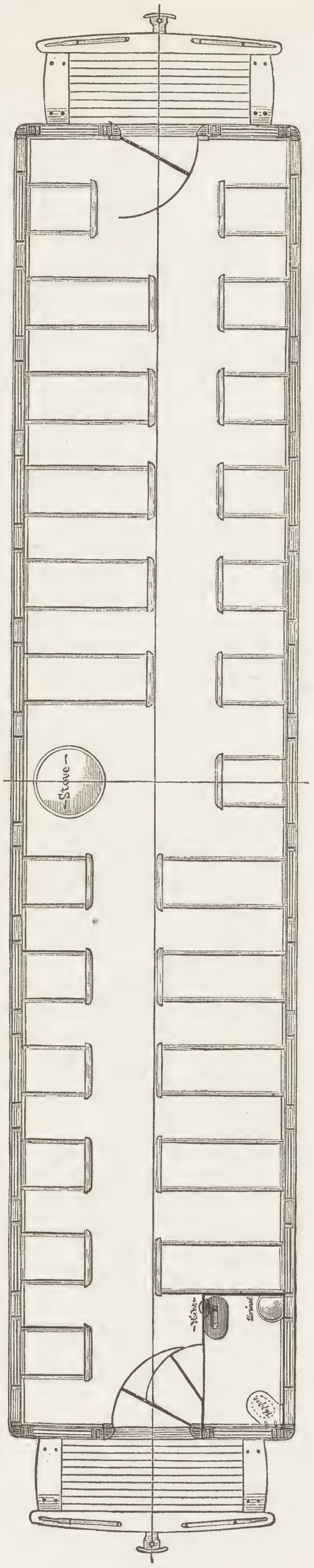
Lastly, we come to the Westinghouse automatic arrangement, and this, we think, we may safely say is the only one shown by the recent trials to possess all the requirements of a thoroughly efficient continuous brake. This brake proved far more prompt and powerful in its action than any of its competitors, while it acted perfectly on the train, being parted by a slip coupling ; and it is moreover capable of being applied from the rear or from any portion of the train at pleasure. It also constitutes, in addition to an efficient brake, an equally efficient signaling apparatus. With no brake on the ground could the breaking up or remaking up of a train be more readily performed, while a spare length of pipe is all that is necessary to enable the brake communication to be led past a carriage not fitted with the apparatus. Excellent as was its performance, too, we do not believe that the Westinghouse automatic brake was seen at its best during the late trials. We ourselves believe it to be a mistake to apply a powerful brake to act upon blocks fitted to one side of each wheel only, and we believe that had the Midland train been fitted with double blocks, the stops made would have been still more prompt. However this may be, the performances, as they stand, were far beyond those of any other brake, as a reference to our table will show. As regards durability and general reliability in every-day practice also, it must be remembered that no brake sent to the recent trials has been so extensively or thoroughly tested as the Westinghouse, and this is a fact which it is well to bear in mind.

Wrought-Iron a Mystery.

DR. ANDERSON, in his lecture on "Tools," lately delivered at Manchester, England, said, "When we think of any sort of material beyond the working treatment of their mechanical properties, we seem to be in another world. Take, for example, a piece of common wrought-iron. It seems to us as of the earth earthy, but if we are closely questioned in regard to the reason for its various properties, we find that we scarcely know any thing. Tracing it from the ore through its various stages until it is in the hands of the smith is comparatively easy. We know the natural law that governs its elasticity, the limit of its elasticity, its ultimate strength ; that it can be welded ; that it is ductile, and can be drawn out into a fine wire ; that it is malleable, and can be spread out into a sheet, or worked round from the sheet into a goblet, and may be gathered back again, if by so doing it served any useful purpose ; but when we think of the marvelous changes which have taken place among its molecules during the operation, we are lost in wonderland. To many minds, the piece of cold iron seems to be a solid ; under the pressure of the testing machine, it is shown to be an unstable fluid. When the smith has the misfortune to leave a piece too long in the fire it vanishes; it has found evil companions, and gone off under an assumed name and a new character. When a piece of iron is broken and carefully examined under a microscope, we can see that it is composed of fine crystals ; but these crystals, we are told, are composed of innumerable molecules, which are not to be seen by the microscope, being smaller than the human mind can imagine ; still, the smith feels himself under their influence. In homely words, he speaks of the iron being 'red-short' or 'cold-short,' without thinking that he is on the threshold of some of the impenetrable secrets of nature. The steel-maker can take advantage of the molecular properties. With heat he can push them asunder and infuse amongst them the subtle vapor of carbon, and the iron becomes steel, highly improved in most of its mechanical properties, and with an increase of strength and elasticity. It may be inferred that each iron molecule is a little world in itself, surrounded with a thin wrapping of infinite space, no single molecule being in actual contact with any other molecule. We have reached the limit of subdivision so far as the engineer dare venture. The investigating philosopher, however, ventures much further with his speculations; he tries vainly to penetrate into the supposed ultimate atoms of matter of which the molecules are composed, but further we need not follow. Suffice to say that a piece of common wrought-iron is altogether a mystery, and teaches man the lesson of humility."

EVER since the New-York and Canada Railroad was finished between Whitehall and Ticonderoga, at a place called "Nigger Hollow," in the northern part of the town of Putnam, great trouble has been experienced by the road-bed sinking. The place is located in a swampy portion of the lake. Numerous loads of earth have been dumped in the place, but still the road-bed continues to disappear. Old canal-boats have been sunk alongside of the road, on the hulks long timbers have been placed, on the top of which immense quantities of stone have been laid. Still the track has persisted in sinking, and when a train of cars passes over the spot the speed has to be materially slackened.





Narrow-Gauge Passenger-Car, built by the Harlan & Hollingsworth Co., Wilmington, Del.

Narrow-Guage Passenger-Car.

THE engravings represent an elevation and plan of a first-class narrow-gauge passenger-car built at the works of The Harlan and Hollingsworth Company, Wilmington, Del. The dimensions do not differ essentially from those adopted by other builders, and are as follows:

Length of car in frame, 35 feet; width in frame, 7 ft. 6 in.; extreme width over mouldings, 7 ft. 11 in.; height inside from floor to head-lining in centre of aisle, 7 ft. 9 in. The total weight of car, finished, is 17,000 lbs.

The inside work is of hard wood throughout, being a combination of black-walnut and ash, with veneered panels between and over windows; hard wood sash and blinds, engraved ornamental glass and patent ventilators in sides of raised roof, decorated head-lining, the under side of raised roof tastefully ornamented with carved hard wood brackets; Buntin patent iron seat-frames with plated arm-caps and curved revolving backs upholstered and covered with plush; two centre-lamps in roof over aisle, and one bracket-lamp to light saloon; one stove with box for coal or wood, in centre of car.

The outside of the car paneled, and the roof covered with best quality of tin. First-class trucks with double elliptic cast-steel springs under swinging bolsters, and steel spiral springs on equalizing bars; 24-inch best passenger-car wheels on wrought-iron hammered axles.

Mechanical Genius.

WE know at least a score of men who, although intelligent enough in other respects, do not know how to drive a nail in a workmanlike manner. As boys, they were educated with a view to practicing certain vocations or professions, and mechanical arts were completely ignored by their unwise parents or guardians. Now it is essential to every man—lawyer, preacher, physician, merchant—to know some of the principles of mechanical art, and how to apply them, for no man leads an industrious life without very frequently seeing the use of such knowledge. There are certain mechanical rules that apply to almost every piece of work that man attempts to perform, from the folding of a paper to the matching together of two boards, and the bungling manner in which these things are generally done show how little idea men have of mechanism. Then, fathers, whether city men or country men, fit up a work-shop for your boys. A small set of tools, of the best material, will not cost much—not more than ten or twelve dollars at most—and they will soon return to you thrice their value in the good accomplished. Where there is a comfortable work-shop supplied with good tools, the boys are seldom known to leave it upon leisure days to loaf in the streets. If nothing else is given them to do, they will be manufacturing wind-mills, sleds, weather-cocks, hand-carts, etc., and every hour thus employed adds to their skill as workmen. Very soon they will be able to make rainy days as profitable as others, repairing or making very important fixtures about the house. We have known boy-mechanics who have supplied their homes with brackets, flower-stands, step-ladders, and a hundred and one other things convenient and valuable.—*Ex.*

THE Chicago *Tribune*, of a recent date, says: Owing to the low price of steel rails, our old and substantial railway companies, such as the Rock Island, Chicago and Alton, Illinois Central, Michigan Central, and also the Union and Central Pacific, have all given large orders for steel rails, to be delivered during the current year. Well-informed parties report the aggregate of these orders at 75,000 tons. Most of these contracts were taken by the Joliet, North-Chicago, and Union Rolling-Mill Companies, and they are sufficient to keep their respective steel departments fully occupied during the year. With the exception of a few miles of double track in process of construction by the Chicago and Alton Company, all these are to replace the old worn-out iron rails; and a gentleman, whose opinion is worthy to be well considered, assures us that if the Grangers will only keep quiet till these main lines have their tracks laid with steel rails, they will get lower freights. The adverse legislation in Wisconsin, it is understood, will prevent the Northwestern from laying any steel rails in that State.

THE Midvale Steel Works, at Nicetown, Philadelphia, have recently achieved a decided success in the manufacture of passenger-car axles to fulfill the requirements of the Pennsylvania Central Railroad, and, as a result, have obtained the first large order for this grade of steel axle given to an American house. The requirements referred to are as follows: An axle must stand five blows of a 1640-lb. drop falling 25 feet, the axle to rest on bearings three feet apart, and be turned over after each blow, so as to present the opposite side for the next stroke. To make a large number of these axles, every one of which can be guaranteed to stand this test, necessitates the regular production of a high grade of metal, very homogeneous, and nearly definite in composition.

The National Car-Builder

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JAMES GILLET, EDITOR.

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AUGUST, 1875.

Editorial Announcements.

CORRESPONDENCE.—*We cordially invite the co-operation of the railroad public in affording us the material for a good mechanical paper. Articles relating to rolling-stock and machinery, by those practically acquainted with those subjects, will be gratefully received. All communications must be addressed to Vose, Dinsmore & Co., No. 32 Warren Street.*

ADVERTISING RATES.—*For one square, or one fifth of a column, $5 per month, or $50 a year. For half a square, $3 per month, or $25 a year. Larger advertisements by special contract.*

All communications in regard to advertising should be addressed to L. F. DINSMORE, *Post-Office Box* 4055, *New-York City, who is our agent for advertising, and authorized to make contracts, collections, etc.*

ENGRAVINGS AND ILLUSTRATIONS.

We would invite the attention of Master Car-Builders and others to the advantages to be derived from publishing in THE NATIONAL CAR-BUILDER *engravings designed to illustrate the various features and details of car construction, and especially such improvements as can not otherwise be clearly presented. We will procure cuts to be made in the best manner from drawings or models that may be sent us, and charge only for the cost of engraving, inserting the same in our paper with suitable descriptive details, without charge.*

The Car-Wheel Problem.

THE brief discussion which took place at the Car-Builders' Convention on the subject of car wheels will be found in another part of our paper. Although but a few members expressed their views, enough was said to indicate pretty clearly that a good deal is yet to be learned before the mystery as to what constitutes the most serviceable and economical car-wheel is thoroughly cleared up. The committee was unable to make any report, owing to a lack of the necessary information upon which to base a reliable statement of facts and conclusions. The subject was of too much importance, however, to be silently dismissed or postponed, and the debate which ensued, although little more than a lively tilt between the advocates of steel-tired wheels and cast-iron ones, was sufficient to develop a wide difference of opinion and experience in regard to both, as well as a lamentable lack of the means of determining the comparative merits, not only of steel and iron wheels, but of the various kinds supplied by different manufacturers. In the absence of definite mileage statistics, it was manifestly impossible for the convention to arrive at any satisfactory results, and the subject was therefore deferred for another year, when something tangible in the shape of a report will be expected from the newly organized committee.

It is evident that the bottom facts in regard to wheels can only be ascertained by getting at the wheel mileage; and in order to get at this, there must be something besides loose estimates and guessing. At present, it is generally assumed by railway companies and wheel-makers that the average mileage of 33-inch chilled iron wheels, made of good stock, is 50,000 miles. This, however, is by no means an ascertained fact. There are some careful observers who insist that 30,000 is a fair average, while some manufacturers claim as high as 150,000, and even more, for iron wheels of exceptionably good quality. Where the extremes are so wide asunder, and indicate such a corresponding difference in quality and wearing capacity, the general average is of secondary importance. It does not help determine which is the best wheel. Let it be conceded that the proper life of iron wheels ranges from 25,000 to 100,000 miles—not that only a very few exceptionably poor wheels make the minimum mileage, and all the rest twice or three times as much—but that this is the general range of the iron-wheel product in the aggregate. Let it also be assumed that the price of these wheels does not vary materially from $20 each. How is the vital matter of railway expenditure affected by this approximate uniformity in price, and the immense difference in the service of wheels? If a road is really getting but 30,000 miles out of wheels of a certain make, while another road is getting 50,000 out of other wheels that cost no more, the loss to the former road is $8 per wheel, the ratio of loss or gain corresponding to the lesser or greater mileage of such wheels respectively. Whoever makes the wheels, and whatever stock goes into them, whether the best pig metal or old wheels remelted, or both, the measure of their intrinsic economic value is the comparative service they render, and this can only be ascertained by their actual mileage life, with due regard, of course, to any exceptional conditions of wear and tear. If, therefore, a railway company with a traffic requiring the use of 30,000 wheels is ignorant of the service rendered by such wheels, it is sinking every year a vast amount of money without knowing it. Their service should bear a fixed relation to their cost, and there should be a way of finding out what this relation is, so that every road can know whether it is getting the worth of the money it pays for wheels; or, if it is a truck-and-dicker transaction, there would still be a satisfaction in knowing that a proper equivalent was received for the old wheels.

There is no way of solving the problem, that we can see, nor any basis for an intelligent discussion of it, short of a practical system of car mileage. Without this, the wheel question will always be a subject of controversy, and the best that conventions or committees can do will be to grope and stumble toward conclusions, with no certainty that they are right when such conclusions are reached. The discussions will only be a jumble of discordant individual opinions swayed by interest or prejudice, throwing no light on the subject, and leaving it where it was the year before. The preliminary work has got to be done by the roads by devising and putting in operation a practical plan for ascertaining the mileage of cars and wheels. There must also be good fitting and rigid inspection. There would also be many incidental advantages attending such a system calculated to promote economy in the operation of roads. These will readily occur to most railroad men.

But the practical question is, How can the wheel mileage of freight-cars be kept with any approach to accuracy? It would seem to be a very difficult matter—the trains are so broken up, to say nothing of the interchanging constantly going on, and the transfer of wheels from passenger to freight service. Although we can not suggest any specific method, we are inclined to think it is not altogether impracticable. If we are rightly informed, a plan is already in operation on the Lake Shore road which has given very satisfactory results. This plan may be susceptible of improvement; or, if not, it might be adopted as it is by other roads. Any system will of course be attended with some expense. It can not be matured and operated by master car-builders alone; they must have the co-operation of managers and superintendents. It is well known that iron wheels are capable of being greatly improved, and that those furnished by some makers do twice as much service as those supplied by others. Any means of getting at the mileage would enable the roads to get rid of the rubbish by discriminating between poor wheels and good ones, and this would result in a saving ultimately that would more than cover the expense of keeping the mileage.

We hope the new committee will lose no time in beginning its work. It is not cumbersome in size. The three gentlemen who constitute it are experienced and practical car-builders; they have the whole year before them, and if their inquiries are industriously prosecuted, and the right kind of aid afforded them by others, they will be able to present a report at the next meeting of the association that will throw much needed light on the wheel problem, and lead to a more profitable discussion of the subject than that which took place at the last meeting.

Patented Car Improvements.

THE mechanical requirements of railroads are a perpetual stimulus to invention. An unceasing demand exists for new or improved devices. The two great essentials of safety and economy are never so perfectly realized as to satisfy either the road managers or the public. The burden of nearly all the talk when engineering and mechanical associations meet for consultation is how to remedy existing defects by the use of better methods and appliances. This, with the inherent capacity of railways for development, offers an inviting field to inventors, which they have not been slow to cultivate. The consequence is that a multitude of inventions are pressed upon the attention of railroad men, some of which are intrinsically good and meretorious, while the vastly greater number are absolutely worthless. But so long as inventors persist in patenting the products of their ingenuity, railroads must pay for the right to use them, or not use them at all. A discrimination must also be made, in order to select such as are really valuable, and this can be done in no other way than by careful experimental testing, uninfluenced by the interests or claims of patentees.

The discussions of the Car-Builders' Association at its last and previous meetings evince a sensitiveness on the part of some of the members in regard to the use of patented devices which is not calculated to secure the advantages to be derived from them. The impression seems to prevail with some that such devices are not only inadmissible as legitimate topics of discussion, but that the many needed improvements in the construction of cars must be provided, as far as possible, without paying tribute to inventors. Now this would unquestionably be a very good thing for the roads, if it were at all practicable. There is, however, a very serious obstacle in the way of carrying out such a programme. Inventors, as a class, are no exception to the general run of humanity. They are quite willing to receive remuneration for the time and money they expend in getting up good and useful contrivances for making cars run easily and comfortably. If they have any thing to sell which is salable, they do not blush to name a price; and they would just as soon make a livelihood out of railroad earnings as in any other way. It is purely a business transaction between buyer and seller. In this view of the case, it is evident that no very valuable improvements in the design and construction of cars are likely to be discovered and applied independently of patents and patentees. It would, therefore, seem to be right and fitting that all patented inventions for such purpose should be freely discussed by car-builders at their yearly and monthly meetings as the only way of ascertaining what is worthy of being adopted. Any practicable plan for better ventilation, any radical improvement in drawing and buffing attachments, brakes, framing, coupling, etc., must work a saving in expenditure, or augment the comfort and safety of passengers to a degree which will more than justify the cost of the right to use, or else such improvements are hardly worth a trial.

We are aware that there is a difficulty attending the discussion of the merits of rival inventions, or, indeed, any patented invention having relation to cars. If this, that, or the other device is approved or condemned, a suspicion is apt to be aroused that undue influences have been brought to bear, that somebody's axe is being ground, or somebody's fortune made or unmade, while others equally worthy or unworthy do not get what is their due. It is hardly possible that entirely disinterested action can be secured in such cases; but action of some sort can not very well be evaded. It is obviously not the business of the Car-Builders' Association to make or unmake the fortunes of inventors, or to discriminate between rival claims, except on the score of actual merit; but it is certainly bound to recognize inventions, and pass upon their respective merits, so far as the interests of railways within the limits of the car departments are affected thereby.

The Keely Motor.

THE claims set up in behalf of this newly discovered motor, if indeed it has any title to be called such, are so extraordinary that it is no wonder that some curiosity is felt to know precisely what it is. Nothing, however, has been ascertained as to its real character beyond certain statements made by parties of acknowledged intelligence and scientific repute, to the effect that Mr. Keely generates a cold vapor from air and water, the expansive force of which produces an enormous static pressure. It is assumed by the credulous, that this force or pressure is necessarily an available motor, and can be applied to all purposes for which steam is used; and that inasmuch as nothing but the simple elements of air and water are needed to produce it, it will supersede the use of fuel in propelling all kinds of machinery, and so forth. However desirable such an event may be, people with level heads will not take an inventory of the chickens before the incubation is fully accomplished. They will wait for a more rational explanation of the thing, or for the train of ten cars with a fireless, smokeless, cold locomotive, to move over the track between Philadelphia and New-York; and we are inclined to believe that such a long period will elapse before this takes place that very few of the present generation of men will live to see it. It is not exactly to the point to quote the disparaging things that were said a century ago in regard to the possibilities of steam as a motor, because the capacities of steam were clearly manifest at the start; there was no mystery about it, no waiting for patents to be secured all over the world, no well-grounded suspicions of humbug. We have heard enough of what the Keely motor can and will do; it is time that the public should be assured of what it has done and does do.

Some Statistics of Railroad Travel.

WHEN the first passenger railway was in process of construction in England, forty-six years ago, ominous forebodings were freely expressed by scientific men. The birds would be killed; the fields and towns would be set on fire; and it was shown that passengers could not breathe when traveling at such rapid rates. The *Quarterly Review* said that "railway traveling was about as safe as being fired out of a rocket." Sir A. Carlisle said "the clash of reverberating sounds would combine to produce an idea of destruction and a thrill of annihilation." Others declared the jar and rattling would cause diseases of the nerves and the brain.

The statistics of European railways have brought out some very curious facts. They show that the risk of a person losing his life in a rail-car is less than being struck by lightning or being hanged; and that a passenger shooting along at the rate of 72 miles an hour—a speed which their express-trains make—is more secure from bodily injury than a pedestrian in a crowded city, or a gentleman driving his carriage on a country road. French statistics show that stage-coach riding is fifty times as dangerous as traveling by rail. No other mode of traveling is so safe as that by rail; in fact, it is a little safer than staying at home and going about one's regular business. In Prussia, it requires the transportation of 25,000,000 persons before one is killed, and 4,000,000 before one is injured. On stage-coaches in France, one passenger in 355,463 is killed, and one in 29,871 is injured.

Mr. Charles Francis Adams, Jr., Railroad Commissioner of Massachusetts, has brought out some statistics of railroad traveling in that State which are quite as favorable. He says a person may travel 800 miles a day for seventy years before he would, on the doctrine of chances, receive an injury by a railroad accident; 22,000,000 persons may travel each fifteen miles before one of them is killed. And yet people, when they are about to make a journey by railroad, take out an accident policy! They had better take out a policy when they intend to stay at home. There is more danger of being murdered in one's bed in Massachusetts, than traveling on a railroad, day and night, the whole time. In 1873, the railroads transported 42,000,000 passengers and did not kill one. In Boston, the same year, five persons were killed by falling down-stairs, and seven from falling out of windows. Few persons in the respectable walks of life trouble themselves about the likelihood of their being hanged; yet an Englishman's risk of dying by the halter is six times as great as his being killed on a railroad; and if the element of his own carelessness be excluded, it is 130 times as great.

The Master Car-Painters' Association.

WE are requested by the Secretary of the Association to announce that the Sixth Annual Convention will be held in New-York, on Wednesday, September 8th, at the Grand Central Hotel, 671 Broadway. The hour of meeting will be at 10 o'clock A.M.

The committees appointed at the last annual meeting who may be unable to attend, are requested to forward their reports to the secretary, R. McKeon, Esq., at Kent, Ohio. It is earnestly hoped that every member will be in attendance. All master car and locomotive painters are also cordially invited to attend and take part in the proceedings.

It will be observed that the day above named is one week later than was announced in the last annual report.

WE again request our readers to give us prompt advice of any errors they may notice in our Directory. The changes of late have been very numerous, and it is impossible for us to make the proper corrections unless the parties send us the necessary information. With respect to managers and superintendents, we rely largely upon circulars, and announcements in our exchanges; but with respect to master mechanics and car-builders, our dependance is mainly upon our correspondents for notice of changes that occur. This information, so desirable to us, can be communicated by postal card with but little outlay of money or time. Will our readers give it their attention, and thereby enable us to make our directory approximately correct?

THE Official Report of the proceedings of the Car-Builders' Convention, in the usual book form, will be ready for distribution some time during the month of August.

AN interesting article on the End-Play of Journals, contributed by Mr. Reuben Wells, of the Jeff., Mad. and Ind. R.R., was received too late for our present issue. It will appear in our next.

A SUBSTITUTE for ink has been devised in Berlin, which consists of points, like the leads of ordinary pencils, that can be fitted into holders. The writing at first very much resembles lead-pencil marks, but moistened immediately assumes a violet tint, and then adheres to the paper like ink. As many as six good copies can be taken from it by means of an ordinary copying press.

Steel Railway Axles.

SOME tests of the comparative strength of steel and iron railway axles have recently been made in this city and elsewhere, and accounts of the results have been going the rounds of the newspapers for some time past. These tests consisted in dropping weights from various heights upon the centres of the axles, and noting the deflection under such blows. In some cases the axles were turned between the blows, and received the weights on opposite sides. As was to be expected, the steel axles were far ahead of the iron, but it is to be noted that the steel axles were sent to the test by a firm who manufacture steel axles, who built the testing apparatus, and who, in fact, seem to have suggested the experiments and carried them out. The steel naturally had a good record, while the iron made a very poor showing. Most of the papers which have copied this item have drawn from it the conclusion that, because steel is stronger than iron, it should be used for axles in the place of the iron. If tests by means of weights subjected an axle to strains in any respect similar to those it encounters in actual service, the results might be considered as conclusive; but they do not; consequently, they are practically valueless as determining whether steel is, or is not, a better material than iron for this use.

It is a cause of much surprise to many that steel has not long ago replaced iron as a material for axles. It has from time to time been tried on railroads, and each time abandoned. The reasons for this may be stated in a few words. In ordinary freight service we have a load of from three to four thousand pounds to each wheel; on passenger-cars the load is sometimes larger, but even the weight of 3000 lbs. to each journal is too often found in practice to be more than the journal can carry without becoming hot. It is also found that the journal must have its size determined as much by the requirements of lubrication as by those of strength. A $3\frac{1}{8}$-inch journal often carries its load, and probably has a considerable margin of safety; but the question of hot boxes is one of even greater importance than the strength of the journal, and the sizes have been gradually increased. The Master Car-Builders' standard axle has $3\frac{1}{4}$-inch journals, while there are in common use a vast variety of sizes, varying from 3 to 4 inches. Above $3\frac{1}{4}$ inches the strength of a good hammered axle seems ample to carry any load which it is desirable to place upon a single wheel.

In order to get the journal with the collar through the eye of the wheel, or axle-seat, the eye must be made considerably larger, so that in the standard axle the wheel-seat is set about $4\frac{7}{8}$ inches in diameter. This great diameter comes at very nearly the point of most frequent breakage. Perfection in manufacture and the increase in size had made broken axles of the standard size an unknown thing, while on those roads using the smaller size, the breakage of a new axle is exceedingly rare. Now, our contemporaries would persuade us that because steel is so much stronger than iron, the iron should be abandoned and steel substituted, and this, too, in the face of the fact that size is what we want, having already a sufficient strength. The breaking of any axle is an accident of rare occurrence, usually traceable to defective turning, a hot journal, or other preventible cause. We should gain nothing in safety from the use of steel, while the cost of the axles would be greatly increased—the size being determined by considerations other than the strength of the metal.

Steel axles have been placed under cars on several different railroads by gentlemen with whom we are acquainted, and in each case they were abandoned on account of their liability to heat. We know this as a fact, although we do not know the reason for it. At all events, it has been shown that a steel axle could not safely have a smaller diameter than is now considered necessary with iron, while the probabilities are it would have to be somewhat larger. Under these circumstances we fail to see where the advantage would be of using steel instead of iron.

Instead of attempting some impracticable thing of this sort, if the gentlemen would turn their attention to the use of steel for the equalizers of passenger trucks, they would be working in the right direction, because the common iron equalizer is weak in proportion to its weight. A strong, light bar, in the place of the one now used, would really be a valuable thing. Our opinion is that the steel men had better give up the idea of the steel axle for cars, and turn their attention to the various parts of cars where more strength, with less weight, is wanted.—*Iron Age.*

A Railroad Three Hundred Feet above a City.

It is difficult to imagine any thing better adapted to produce a vivid and startling impression on the memory than the first sight of Morlaix, Brittany, as approached by rail. The city lies on both sides of a deep, narrow valley, and the railroad springs across the chasm on a magnificent viaduct three hundred feet high. Entirely unprepared for any thing of the sort, the traveler suddenly finds himself taking a bird's-eye view of a city of the middle ages. There it lies, 300 feet below, almost as if it were in the days when Mary Queen of Scots passed through here on her way to Holyrood and the scaffold. The precipitous, winding, narrow, darksome streets, the peaked roofs, misshapen by time and studded with curious dormer windows, are still there as when she looked upon them centuries ago, when with brilliant pageant she and her cortege of knights and ladies swept through Morlaix with laughter and song. Should it be a festal day or a fair, the sight is still more unique, for the square is then crowded with booths and peasants in various costumes, and is positively white with the starched caps of the women. The city is divided by the river of Morlaix, an estuary up which ships come into the heart of the town. The banks of the river are faced with granite, and afford a fine promenade on each side. A smaller stream dashes roaring down the streets, bringing to the dirty lanes of the crowded town the music of the pure fountains whence it came. At Morlaix one finds himself literally in the land of wooden shoes. Almost without exception they are worn by all—of various forms and sizes, colored or uncolored, to suit the whims or purse of the wearer, but always the sabot. The clatter when the streets are crowded is almost deafening. A crowd of forty or fifty women walking together down the quay from the fair gives exactly the sound of the tread of cavalry, the same confused and indescribable ring of many hoofs on the pavement.

Mann's Sleeping-Coaches.

The London *Engineer* says, "An experimental trial-trip from London to Cambridge and back has been made on the Great Northern Railway, in order to test the performance of one of Mann's boudoir sleeping-cars, described by the proprietors as a new design of a carriage of luxury for the public. We have already mentioned the fact of these cars being used on the Paris-Vienna line. The car, which fully justifies, by the perfection of its fittings, the term a 'carriage of luxury,' is 30 feet long, and differs from the Pullman sleeping-cars in two chief characteristics: first, that instead of having one large room, it is divided into four small compartments or boudoirs; second, that its beds are placed transversely to the line of railway. Two of the compartments make up four beds each, and the remaining two two beds each; and they are perfectly inclosed and secluded on all sides. During the daytime the same compartments will afford seats for 18 passengers. The cars are fitted up with lavatories for ladies and gentlemen, and an attendant travels with each, and can be summoned by a bell from each bed. In the beauty and finish of its appointments, the car is quite equal to those of the Pullman Company, and it possesses one special convenience which is worthy of note. This is a set of small steps in each compartment, so arranged that they form the support of a table which can be unshipped and laid aside, and then they assist passengers to mount into the upper sleeping-berths. When they were first introduced, although the comfort of their sleeping-berths was much appreciated, we heard complaints of the oscillation due to a rigid wheel-base for so long a carriage. In the car tried lately, this oscillation was overcome by giving some lateral play to the wheels, and the traveling was admirable in its steadiness. The journey of 59 miles to Cambridge was made in 1 hour and 27 minutes, and the maximum speed attained was at the rate of 60 miles an hour. The car is not of the newest pattern, and its weight—14 tons—exceeds by 3½ tons that of some which are now running on the Continent, and which afford equal accommodation for the same number of passengers."

An Elegant Postal-Car.

Nothing in the recent improvements which have been made in the mail service has met with a larger share of public favor than the new system of "making up" and distributing mails on the great railway lines. The Central Vermont Railway Company has just completed, at its shops at St. Albans, a postal-car which is, without doubt, one of the finest of its class in the United States, and which, indeed, seems to embody every thing needed. It was built under the personal supervision of Mr. James M. Foss, superintendent of motive power and machinery; and its convenience and elegance of design have won universal commendation. The car, which cost about $10,000, is furnished with patent journal-boxes and improved trucks, and will be duplicated in all essential features in the mate which is now building at Concord for the Northern Railway. The importance of the postal service between Boston and Rouse's Point is very great, and on no other line will "new improvements" meet with keener appreciation. Nearly 200 different mail-bags have to be made up on each trip between Boston and the Canada line. Among the noticeable devices of the new car are the arrangements for rapid sorting and delivery of the mails which are received "on the wing," the thorough provision for light and ventilation, and the disposition of the through pouches, fixtures, etc. The car, which is 43 feet long, is divided into two compartments, one for receiving and the other for delivering the mails. In point of elegance of frescoing and painting, the car, which is finished in ash and black-walnut, and bears the United States shield at each corner, is a model of beauty. With its companion, which will soon be ready for service on the line, the new postal-car is well worth a careful inspection.

Professor R. H. Thurston, of the Stevens Institute of Technology, and chairman of the United States Board appointed to test iron, steel, etc., in a circular dated Hoboken, N. J., says,

"The executive officers of all lines of railway may render valuable aid by furnishing statements of the wear of rails per ton of transportation, specifying with care the original weight, the make, and the character of the rail, the total amount of transportation, the length of time occupied, and stating whether the rail finally broke or was removed. Specimens of rails remarkable either for endurance or for a lack of this quality, if sent to the committee, will be of use in assisting in the determination of the chemical and other properties which most affect the value of the material under the stated conditions of use. Similar statistics and information in regard to the wear of wheels, axles, and other parts of rolling-stock and machinery will be equally valuable. Engineers having in any instance noted and accurately recorded such data, are requested to transmit to this committee copies of their memoranda. The wear of journals under heavy loads, or at high velocities, as well as under ordinary conditions, is an important branch of this subject. When possible, it is desired that the dimensions of the journal, the maximum, the minimum, and the mean weight sustained, and velocity of rubbing or number of revolutions per minute should be given. The nature of the lubricant is an essential element, and its composition should be stated, the method and frequency of application and the quantity used should be given. When known, or readily ascertained, the coefficient of friction should be given. It should also be noted whether heating occurs, and under what circumstances of pressure and velocity of rubbing surfaces. Peculiar instances of the behavior, or unusual expedients in the management of bearings, if described accurately and concisely, will be accepted with thanks."

The Philadelphia correspondent of the *Iron Age* says: "We have to chronicle a contract which has just been closed by the managers with a passenger railway company here, by which they are to construct and operate within the Exhibition grounds a double-track narrow-gauge railroad, which will traverse the entire circle between the various buildings, a distance of some three and a half miles. This road is to be equipped with five locomotives and forty palace-cars, all of which are tendered the company free of cost by different locomotive and car-builders of the country. While this will be a great accommodation in affording means of transit to visitors, it will also be a splendid advertisement to the shops furnishing the cars and engines. It is also a suggestion to numerous manufacturers of all sorts of conveniences and comforts to the public, to place them at the disposal of the commission, to be used throughout the grounds, thus accommodating the visitors and benefiting themselves at the same time."

The *Bulletin* of the American Iron and Steel Association, speaking of the Western iron trade, says: "Commencing at Pittsburg, it shows every sign of healthy activity. Profits are of course restricted—not what they once were; but the stagnation in the trade which existed last winter is gone. Nearly every rolling-mill at Pittsburg is running and selling its product. All the large steel works in the same city are as busy as they can be. Their product is sold up, and their owners have the money for it. Never before has the Western demand for their agricultural steel been greater than during the past few months, while a gratifying increase in the demand for their tool and cutlery steel has come from all sections."

The new and extensive addition to the Pennsylvania Railroad Company's workshops at Altoona, renders the establishment the most complete in this country. The new building is about 800 feet long by 70 wide, and is built of brick, the side walls being from eight to twelve feet thick and one story high, with arched roof. It is known as the machine-shop, where the engines are "set up" or put together. A single line of track enters the building from either end, but inside there are three tracks. A locomotive "ordered to the shops" is taken just over the threshold of the building, when it is picked up by a patent crane, costing $42,000, and carried either upside down, sideways, or in other positions to any part of the shop. If a new boiler or fire-box is needed, the engine is torn apart in a jiffy; the parts are piled on the platform floor, the floor is lowered to the basement, and the boilers are taken to the boiler-shops. The boiler being renewed, it is carried back, and the locomotive is set up again ready for the road. A spectator might stand looking in amazement while a locomotive disappears by piecemeal before he can realize the situation. The shops at Altoona are a wonderful study for the lovers of machinery. In the language of the "gang boss," they "have a lathe which will do every thing but talk."

Messrs. W. & C. W. Booth have purchased the business and stock of the late firm of A. Parker & Co., dealers in foreign and domestic cabinet woods, 168 Centre street.

A GENTLEMAN recently called at the Remington gun manufactury at Ilion, N. Y., with the view of making the purchase of some arms. He was shown through the works, and evinced great interest in all the processes. At the close of his tour of inspection a gun was shown him and repeatedly discharged in his presence. He was then told that since his entrance into the works every part of the identical gun just fired had been manufactured and put together, and that his own eyes had witnessed every stage of the work. He then offered to purchase five car-loads of guns which the Spanish inspectors had recently rejected, probably with the view of getting some small reduction, and paid the Messrs. Remington the price named in the original contract. It is supposed that this unknown gentleman was an agent of Don Carlos. If this be the case, the Spanish government has, through its officials, quite over-reached itself.

THE Indianapolis Rolling Mill has contracted to make for the Jeffersonville, Madison and Indianapolis Road new iron rails sufficient to relay seventeen miles of track, the rails to be furnished as fast as the company needs them, between this and November 1st.

THE produce exports from New-York for the week ending July 7th amounted to $6,190,155, against $7,387,186 for corresponding week last year. The total exports of produce since January 1st are $127,942,150, against $152,367,873 for 1874.

A NEW machine for pressing coal-dust into fuel was put into operation at the Harrisburg machine-shops the other day, and a ton of solid coal was made in six minutes. The machine is said to be simple and universally practicable.

A KNOWLEDGE of science attained by mere reading, though infinitely better than ignorance, is knowledge of a very different kind from that which comes from contact with facts.

Nashua Cast-Steel Tires.

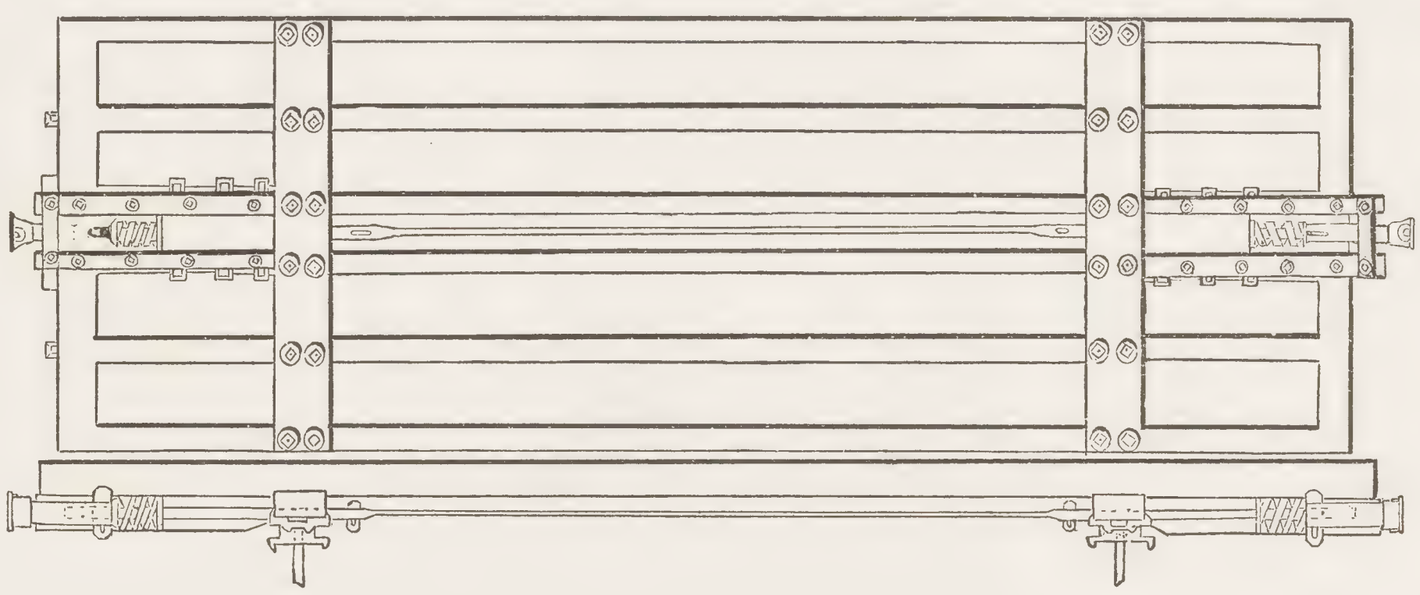
THE Nashua Iron and Steel Company, of Nashua, N. H., was organized about thirty years ago, and has become widely and favorably known for the superior excellence of the products of its manufacture, embracing cast-steel tires, steel car and engine-axles, fire-box and boiler-plates, crank-pins, piston-rods, shafting, and also iron forgings of every description. Its facilities in the way of machinery and the most approved mechanical appliances are equal to the best. We learn, by a recent circular issued by the company, that in order to meet the declining prices of manufactured tires, they are now manufacturing steel blooms for the same at their own works, instead of depending for them, as they have hitherto done, upon Messrs. Thomas Firth & Sons. The large additional outlay involved in this extension of their capacity enables the company to fill orders with greater dispatch, by avoiding the delays incident to the foreign importation of stock and material.

Mr. E. C. Perkins is the contracting agent. His long connection with the company, extending through a period of twenty years, has made him thoroughly familiar with the wants of the trade with reference to the leading specialties above named, and particularly as respects that important feature of locomotive engines, steel tires, of which he guarantees to supply our roads with an article as perfect in every respect, and as serviceable, as those of the "Krupp" or "Firth" brands.

The Company's office is at 44 Simmons Building, Boston. Mr. Perkins is in New-York every week.

Griffith's Continuous Draw-Bar.

THE engraving illustrates a Continuous Draw-Bar, designed by Mr. Samuel Griffith, the master car-builder of the Indianapolis, Cincinnati and Lafayette Railroad. A model of this improvement was exhibited by the inventor at the recent meeting of the Car-Builders' Association, where it was made the subject of an interesting discussion, a report of which was contained in the record of proceedings published in our last issue. Attempts have heretofore been made to apply the principle of a continuous draw-bar to cars; but owing to inherit defects, it has not been adopted to any considerable extent. It was conceded, however, by experienced car-builders who inspected the model of Mr. Griffith, that he had fairly overcome the main difficulties of the problem,



by distributing the draught strain equally among the cars of a train, and confining it to the line of greatest strength. Each car is drawn from the rear draw-spring; no dead-woods are used; the rod is so secured that it is not liable to buckle, and is not dependent on the bolsters for support. By means of slots, the rod is subjected to no buffing strains, as these are borne entirely by the sills. The drawing represents a plan of the floor-frame, and also a detached longitudinal sectional view, showing the centre-bit casting by which the head of the king-bolt is held without passing through the bolster—the continuous rod passing through the bolster directly over the king-bolt.

As stated by Mr. Griffith to the convention, the plan has been tested on a train of 50 cars on the above-named road, some of which were employed in carrying stone during all last winter, making 320 miles a day, and so far without any breakage or any expense for repairs.

THE Wason Company at Springfield, Mass., has just finished nine passenger and 26 freight-cars for a South-American road.

A 60-TON steam hammer is being constructed by the great French Steel Works at Creusot, which is 10 tons heavier than the famous Krupp hammer.

THE Baltimore and Ohio and Illinois Central Railroad Companies are going to unite and construct a magnificent depot on the Chicago lake front.

A HUGE wooden hotel, ten stories high and containing a thousand double-bedded rooms, is to be erected in Philadelphia, to accommodate Centennial visitors.

THE Ramapo Wheel and Foundry Company has recently received orders for 600 car-wheels from the Argentine Republic, and for 200 from an English car-building company.

DITTMAN'S STAR NUT-LOCK.—The reader will find this device illustrated and described in our advertising columns, page x. It is so constructed as to prevent the backward rotation of the nut from the effect of jars and concussions, and also to take up automatically the expansion and contraction of the bolt by changes of temperature. It is guaranteed not to be an infringement upon any other invention of the same class.

Facetiæ.

"VEN some man slaps me on der shoulder und says, 'I vas glad to hear you vas so vell,' und den sticks pehind my back his fingers to his nose, I hof my opinion of dat veller."

"CAR spring chickens" is what the Chicago *Inter-Ocean* man calls the fowls that are set before him at his boarding-house."

Is this intended as a compliment to car-springs or to chickens; or is it merely a boarding-house puff?

A "CULLUD chap" was hugging a salmon-colored maid on the levee, recently, when she whispered sweetly in his ear, "I don't mind your huggin' me, Jim, but, fo' de Lord's sake, don't touch dat bile on de back o' my neck."

AN ingenious Italian has invented an earthquake indicator. It fires off a gun when the earth begins to quake, and then every man who has provided himself with an indicator knows that an earthquake is going on; while those who carelessly neglected to provide themselves with this useful invention have to guess at it.

SUNDAY was a delicious day. It was nature's grand overture. The sunshine was balmy and brilliant, the air was as gentle as an angel's touch, and the birds' melody thrilled earth and heaven. Man walked forth into the country, breathing in the delicious fragrance, bathing his soul in the blessed sunshine, and rejoicing in the glad music of the birds. The next morning he was yelling at the top of his voice, "Where in thunder is that ar thick undershirt, Maria?"

A NARROW-GAUGE man who has been laboring since the passage of the Wisconsin State law, finally produces the following:

Broad is the gauge that leads to death,
And thousands sink their money there;
But Wisdom shows the narrow path
That saves—on freight and passen—ger.

THEY tell a tough story about a new baggage-man on one of our local trains, says the Los Angeles *Star*. He was told to pile up the trunks in a baggage-car, and be sure to hang the checks on the outside. The literal-minded youth piled up the trunks, and then took off the checks, with the leather straps attached, and hung them upon the outside of the car. The baggage-master at the depot was driven nearly frantic by the passengers per the Orizaba attempting to identify their boxes.

OH! bury Bartholomew out in the wood,
In a beautiful hole in the ground,
Where the bumblebees buzz and the woodpeckers ring,
And the straddle-bugs tumble around,
So that in the winter, when the snow and the slush
Have covered his last little bed,
His brother Artemas can go out with Jane,
And visit the place with his sled.

A PALE man with long hair got into the car. It was a cold day, and the seat near the stove was occupied by a man and an inquisitive-looking boy. The pale man backed up to the stove, and casually remarked:

"Man run over just now."

The inquisitive-looking boy sprang to his feet, and rushed out of the car, like a maniac. The pale man settled down in the vacated seat and explained:

"He run over the track, ahead of the engine. He wasn't struck."

NEEDHAM'S
Safety Signal Light,
FOR
PREVENTING REAR COLLISIONS.

Shows in both directions whether the train is moving fast, or slow, or stopped.

In cases of trains uncoupling it is superior to the ***"Block System,"*** and for safety to trains following, it is the ***Best Light in Use,*** indicating by the simplest mechanism, both speed and distance.

CARS EQUIPPED FOR TRIAL FREE.

ADDRESS,

WM. L. NEEDHAM,

No. 81 Hicks St., W. S.,

CLEVELAND, O.

W. LOUGHRIDGE'S AIR BRAKE,

Adopted by and about three years in use on the Baltimore and Ohio Railroad and connecting lines, the Western Maryland, and others, nearly 2500 miles.

The cost to equip and maintain this brake is about fifty per cent less, and its general effectiveness for stopping quickly for emergencies and general purposes is much greater than any other device of its class now claiming railway patronage. Rights for sale at a very low royalty per mile of road, thus enabling all companies to equip their trains and make repairs at their own shops.

Box 477, Baltimore, Md.

WANTED,

By the advertiser, a situation as a Mechanical Draughtsman, or Foremanship, to take charge of a Machine Shop, or both. Locomotive or Stationary Engine Shop preferred. Well experienced in all kinds of machinery, having passed through the shops as a mechanic of twelve years' experience. Good reference can be had from last employer as to character and ability. Apply to C. Percival, 39 and 40 Museum Building, Troy, N. Y.

RICHARD DUDGEON,

No. 24 Columbia Street, New-York,



Maker and Patentee of

Hydraulic Jacks and Punches,

BOILER TUBE EXPANDERS,

AND DIRECT-ACTING STEAM HAMMERS.

Communications by letter will receive prompt attention.

Jacks for pressing on Car-Wheels or Crank Pins made to order.

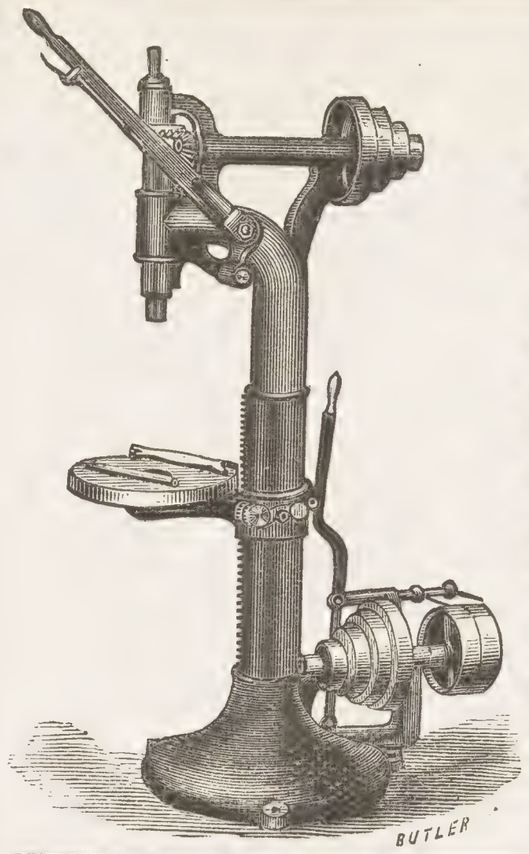
Established 1858.



TRADE MARK PATENTED.

The best and cheapest Paint in the world for Iron, Tin or Wood. For sale by the Trade everywhere. PRINCE'S METALLIC PAINT CO., Manufacturers, 96 Cedar St., New York.

CAUTION.—Purchasers and consumers are cautioned against imitations of our METALLIC PAINT. All genuine *PRINCE'S METALLIC PAINT* will bear our name and trade mark on each and every package. Send for a circular.

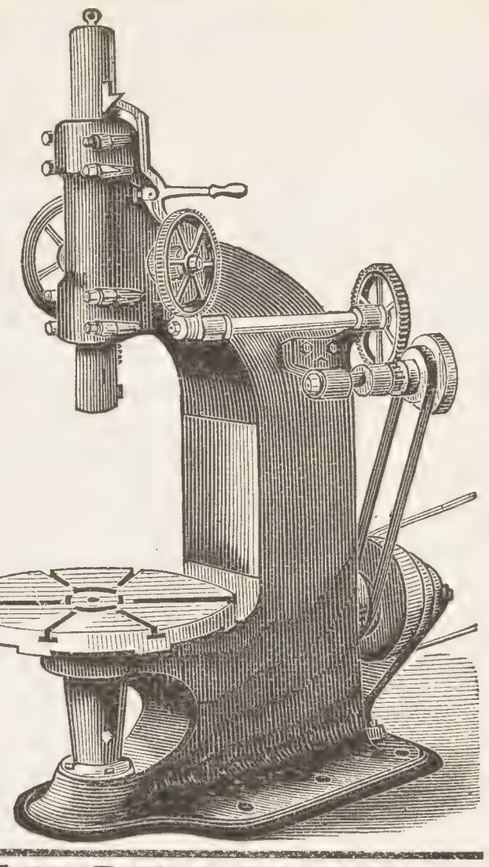


EDWIN HARRINGTON & SON,

Manufacturer of **ENGINE LATHES,** from twelve (12) to forty-eight (48) inches swing; **Hand Lathes; Wood Turning Lathes; Vertical Drills; Boring Mills; Tapping and Centring Machines; Screw Press** for Mandrels; **Grindstone Boxes.**

Cor. North-Fifteenth St. and Pennsylvania Ave.

PHILADELPHIA.

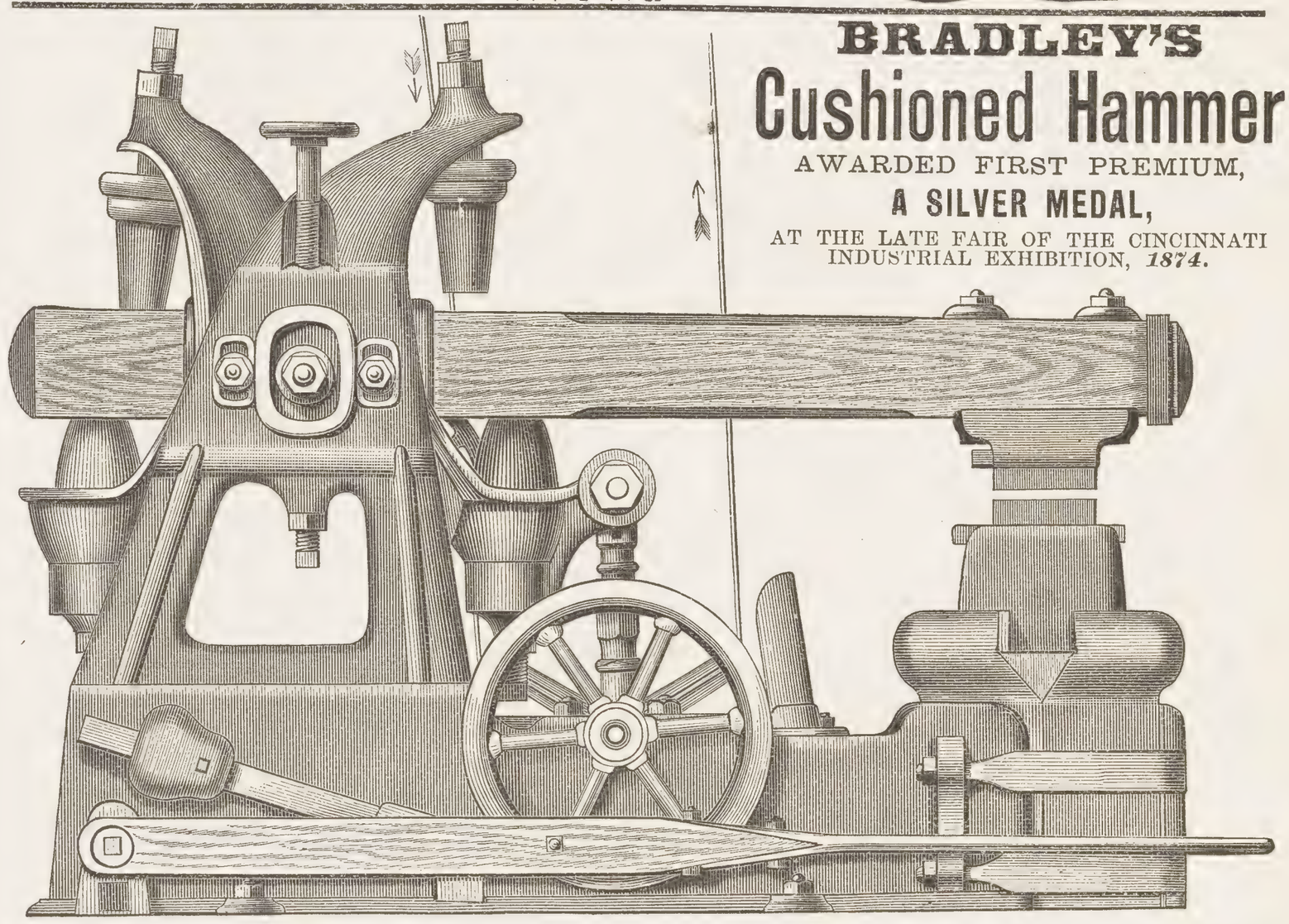


BRADLEY'S
Cushioned Hammer

AWARDED FIRST PREMIUM,

A SILVER MEDAL,

AT THE LATE FAIR OF THE CINCINNATI INDUSTRIAL EXHIBITION, *1874.*



This Hammer has many valuable improvements made useful in the device for cushioning the blow, thereby relieving all the working parts from that jar and concussion which is the destroying element of other helve hammers. It is made

Adjustable in Line of Action, Length of Stroke, Rapidity of Motion, and Weight of Blow,

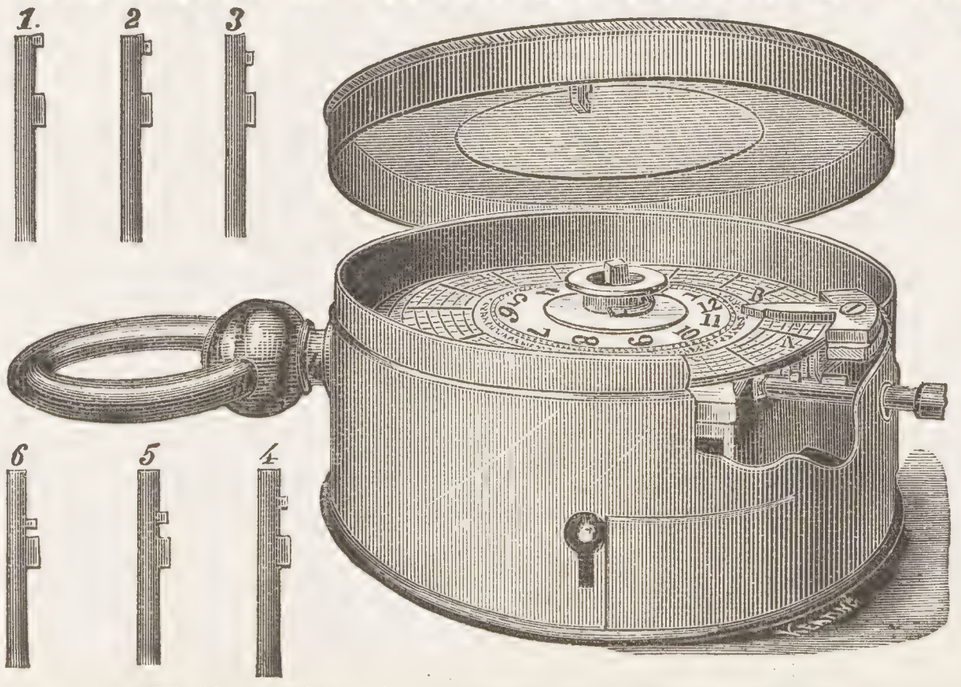
all of which are controlled at the will of the operator. They have

Larger capacity, cost less, are more durable, take up less room, do more and better work at less expense for power than any other Hammer in use.

We guarantee them fully as recommended. For particulars, address

BRADLEY MANUFACTURING CO., Syracuse, N. Y.

BUERK'S WATCHMAN'S TIME DETECTOR.



Important for all large corporations and manufacturing concerns; capable of controlling, with the utmost accuracy, the motions of a watchman, as the same reaches different stations of his beat. Send for Circular.

J. E. BUERK,

P. O. BOX 979,

84 Washington St., Boston, Mass.

N. B.—The public are notified that in my suit against *Imhaeuser & Co.*, of New-York, a decree was made in my favor, June 10, 1874.

Proceedings have been commenced against said *Imhaeuser & Co.* for selling clocks contrary to the order of the Court, and especially the clock with a series of springs in the cover and marked, "Patented October 20, 1874."

All persons discovered using these infringing clocks will be dealt with according to law.

☞ ***In sending for Circular or ordering the above, please mention this paper.*** ☜

DIRECTORY
OF
MASTER-MECHANICS AND MASTER CAR-BUILDERS
THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* Mechanical Engineer. † Mechanical Superintendent. ‡ General Master-Mechanic. †† Gen. Master Car-Builder. § Master of Machinery. ‖ General Foreman. ** Superintendent of Machinery. §§ Superintendent of Motive Power and Machinery. ‖‖ Superintendent of Rolling Stock. ‡‡ Supt. Cars and Buildings.

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Albany & Susquehanna	R. C. Blackall	R. C. Blackall	Albany, N. Y.
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South Side of Virginia "	J. T. Robinett	J. T. Robinett	Petersburg, Va.
Virginia & Tennessee "	F. Sterk	W. A. Morgan	Lynchburg, Va.
Virginia & Kentucky "			
B			
Baltimore & Ohio	§John C. Davis	J. S. Shryack	Baltimore, Md.
Baltimore & Ohio	A. J. Cromwell	James H. Miller	Baltimore, Md.
Baltimore & Ohio	Wm. Edwards		Martinsburg, Va.
Baltimore & Ohio	S. A. Silver		Piedmont, Va.
Baltimore & Ohio	E. W. Lippencott	H. Longest	Grafton, W. Va.
Baltimore & Ohio	E. L. Weisgarber	‖C. Ditman	Wheeling, W. Va.
Central Ohio Division	Alex Platt		Zanesville, O.
S'dusky, Mans., & New'k Div.	Wm. Y. Johnson		Sandusky, O.
Central Ohio Division	§Sam. Houston		Newark, O.
Central Ohio Division	James Stewart		Newark, O.
Central Ohio Division	O. B. Perkins		Columbus, O.
Chicago Division	Geo. Wilson		Chicago, Ill.
Bangor, Old Town & Milford	J. B. Peckham	John H. Brown	Bangor, Me.
Bangor & Piscataquis	Horace Penny	J. W. Comins	Old Town, Me.
Bellefonte & Snow-Shoe	H. D. Landis	H. D. Landis	Bellefonte, Pa.
Boston & Albany	Wilson Eddy	F. D. Adams	Springfield, Mass.
Boston & Albany	A. B. Underhill		Boston, Mass.
Boston & Albany		W. E. Chamberlain	Allston, Mass.
Boston, Barre & Gardner	John Loyer		Worcester, Mass.
Boston & Providence	George Richards	John Lightner	Roxbury, Mass.
Boston, Clinton & Fitchburg	John Webster	Samuel Stevens	Fitchburg, Mass.
Boston, Concord & Montreal	Ralph Adams	M. R. Elkins	Lake Village, N. H.
Boston & Maine	F. A. Waitt		Boston, Mass.
Boston & Maine		D. C. Richardson	Lawrence, Mass.
Boston, Lowell & Nashua	J. F. Crockett	T. G. Davis	Boston, Mass.
Boston, Lowell & Nashua		S. A. Davis	Nashua, N. H.
Brockville & Ottawa	H. J. Marshall	H. J. Marshall	Brockville, Can.
Brunswick & Albany	M. Thornton		Brunswick, Ga.
Burlington & Missouri River in Neb.	J. Christiansen	J. Christiansen	Plattsmouth, Neb.
Burlington, Cedar Rapids & Minn.	R. W. Bushnell	R. W. Bushnell	Cedar Rapids, Iowa.
Buffalo, New-York & Phila	Allen Vail		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. J. Bookhammer	John Monks	Oil City, Pa.
C			
Cairo & St. Louis	W. D. Macfarlane		E. Carondelet, Ill.
Cairo & Vincennes	Chas. H. Cory		Cairo, Ill.
California Pacific	A. J. Stevens	D. Rutherford	So. Vallejo, Cal.
Camden & Atlantic	Rufus Hill	S. Wills	Camden, N. J.
Canada Southern and Branches	‡‡C. E. Benton	††C. E. Benton	St. Thomas, Canada.
Carolina Central	W. A. Gill	Thos. Myers	Laurinburg, N. C.
Catawissa	Wm. Ellis	C. D. Ellis	Catawissa, Pa.
Catasauqua & Foglesville	Thomas Evans	Chas. J. Holbach	Catasauqua, Pa.
Central of Georgia	D. D. Arden	C. C. Millar	Savannah, Ga.
Central of New-Jersey	Wm. Woodcock		Elizabeth, N. J.
Central of New-Jersey	*T. W. Peeples	George Hackett	Elizabethport, N. J.
Lehigh & Susquehanna Div.	L. C. Brastow	L. C. Brastow	Wilkesbarre, Pa.
Central Branch Union Pacific	Geo. C. Benedict		Atchison, Kansas.
Central R. R. of Iowa		T. L. Seevers	Marshalltown, Iowa.
Central R. R. of Iowa	F. B. Woodruff.		Eldora, Iowa.
Central Pacific	A. J. Stevens	Benjamin Welch	Sacramento, Cal.
Western Division	Geo. D. Welch	J. J. Lawler	Oakland Cal.
Visalia Division	S. Johnson		Lathrop, Cal.
Sacramento Division	M. W. Cooley		Rocklin, Cal.
Sacramento Division		Nat. Webb	Truckee, Cal.
Truckee Division	James Velsir	Wm. McPherson	Wadsworth, Nev.
Humboldt Division	H. L. Stevenson	H. B. Hartsman	Carlin, Nevada.
Salt Lake Division	W. H. McKenzie	G. J. Turner	Ogden, Utah.
California Pacific Division	D. Rutherford	D. Rutherford	Vallejo, Cal.
Central Vermont	J. M. Foss	J. M. Foss	St. Albans, Vt.
Harlem Extension Div	C. S. Clapp	C. S. Clapp	Bennington, Vt.
New-London Northern Division	J. W. Dow	S. W. Caulkins	New-London, Ct.
Ogdensburg & L. Champlain Div.	William A. Short	J. R. Ames	Malone, N. Y.
Rutland Division	W. L. Short		Rutland, Vt.
Charleston & Savannah	H. T. Calder		Charleston, S. C.
Chesapeake & Ohio	W. G. Freeman	J. N. King	Richmond, Va.
Chesapeake & Ohio	§T. J. Hamer	H. C. Bassinger	Huntingdon, W. Va.
Cheraw & Darlington	D. W. Haines	A. M. Corrie	Florence, S. C.
Champlain Trans. Co	H. T. Calder		Burlington, Vt.
Cheshire & Ashuelot	F. A. Perry	F. A. Perry	Keene, N. H.
Charlotte, Columbia & Augusta	Robert King	J. C. Troeger	Columbia, S. C.
Chicago & Pacific	A. S. Gurnee		Chicago, Ill.
Chicago & Lake Huron			
Eastern Division	E. Hollis		Port Huron, Mich.
Western Division	W. C. Faulkner		Battle Creek, Mich.
Chicago & North-Western	§Geo. W. Tilton	William Campbell	Chicago, Ill.
Wiscon. Mad. & Mill. Divis		Wm. Campbell	Chicago, Ill.
Wiscon. Mad. & Mill. Divis		Henry Hull	Fond du Lac, Wis.
Galena Division		Hugh Gray	Chicago, Ill.
Iowa Division	C. C. Elliott	L. H. Preston	Clinton, Iowa.
Peninsula Division	Geo. White		Escanaba, Mich.
Chicago & Alton	John A. Jackman	R. Reniff	Bloomington, Ill.
Chicago, Burlington & Quincy	‡Wm. Wilson	††W. W. Wilcox	Aurora, Ill.
Galesburg Division	James Lamb	H. J. F. Small	Galesburg, Ill.
Creston Division	Joel West		Creston, Iowa.
Burlington Division	John Bassler		Burlington, Iowa.
Chicago, Clinton & Dubuque	P. R. Sutton		Dubuque, Iowa.
Chicago, Dubuque & Minnesota	P. R. Sutton		Dubuque, Iowa.
Chicago, Rock Island & Pacific	T. B. Twombly	B. K. Verbryck	Chicago, Ill.
Chicago & Michigan Lake Shore	T. J. Hartswell	D. Sutherland	St. Joseph, Mich.
Chicago, Danville & Vincennes	J. B. Morgan		Danville, Ill.
Chicago, Milwaukee & St. Paul	J. M. Lowry		
La Crosse & P. Du Chien Div.		Wm. E. Kittredge	Milwaukee, Wis.
Northern Div.		John Bailie	Milwaukee, Wis.
Iowa & Minn. Div	J. Pettee	J. Pettee	Minneapolis, Minn.
Hastings & Dakota Division	C. C. Clements		Hastings, Minn.
Chicago & Iowa	H. S. Bryan		Aurora, Ill.
Cincinnati, Wabash & Michigan	E. M. Porter		Wabash, Ind.
Cincinnati, Hamilton & Dayton	James Eckford	W. H. H. Allison	Cincinnati, Ohio.
Indianapolis Division	Edward Moore		Indianapolis, Ind.
Cincinnati, Lafayette & Chicago	Charles E. Gore		Lafayette, Ind.
Cincinnati & Muskingum Valley	Leroy Kells	Daniel Jewell	Lancaster, Ohio.
Cincinnati, Sandusky & Cleveland	J. R. Ames	J. R. Ames	Sandusky, Ohio.
Cleveland, Col., Cin. & Indianapolis	‡L. S. Young	††William F. Smith	Cleveland, Ohio.
Indianapolis Division	A. R. McAlpine		Galion, Ohio.
Indianapolis Division		R. Attridge	Indianapolis, Ind.
Cincinnati Division	D. Carmichael	D. Carmichael	Delaware, Ohio.
Columbus Division	F. G. Kaufholz	Wm. Cleve	Cleveland, Ohio.
Cleveland & Pittsburg	N. E. Chapman	A. Steinbrunner	Cleveland, Ohio.
Cleveland, Mt. Vernon & Delaware	J. W. Holloway	J. W. Holloway	Akron, Ohio.
Cleveland, Tuscarawas Val. & Wheeling	W. F. Turreff		Cleveland, O.
Cobourg, Peterboro & Marmosa	Wm. Polson		Cobourg, Canada.
Columbus, Chicago & Indiana Central	(See Pitts. Cinn. & St. Louis)		
Columbus & Hocking Valley	H. S. Wallace	H. S. Wallace	Columbus, Ohio.
Concord	Chs. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Portsmouth	C. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Claremont	J. N. Lander	A. Langmaid	Concord, N. H.
Connecticut River	§Wm. H. Stearns	R. Hitchcock	Springfield, Mass.
Connecticut Valley	C. W. Hollister	N. A. Smith	Hartford, Ct.
Connecticut Western	N. Slingland		Hartford, Ct.
Contoocook River			Concord, N. H.
Conn. & Passumpsic Rivers	Geo. Kilby		Lyndonville, Vt.
Corning, Cowanesque & Antrim	O. C. Patchell	O. C. Patchell	Corning, N. Y.
Cumberland Valley	A. S. Hull	C. W. Nitterhouse	Chambersburg, Pa.
Cumberland & Pennsylvania	W. L. Jordan	Nathan Binnix	Mt. Savage, Md.
D			
Dakota Southern	Jas. Whitney	A. A. Meckling	Yankton, Dak.
Danbury & Norwalk	Charles A. Craig	C. A. Craig	Danbury, Ct.
Davenport & St. Paul	James Russell		Davenport, Iowa.
Dayton & Union	A. J. Keenan	J. F. Feicht	Dayton, Ohio.
Dayton & Michigan	John Black	W. H. H. Allison	Cincinnati, Ohio.
Delaware, Lackawanna & Western	Walter Dawson	Robert McKenna	Scranton, Pa.
Morris & Essex Division	W. H. Lewis	L. S. Barber	Hoboken, N. J.
Denver & Rio Grande	John Greenwood		Denver, Col.
Detroit, Ft. Wayne & Logansport	W. A. Carpenter		Bankers, Mich.
Detroit & Milwaukee	C. M. Hanson		Detroit, Mich.
Detroit, Lansing & Lake Michigan	Tho. E. Roberts		Ionia, Mich.
Delaware & Hudson Canal Co.	‖‖R. C. Blackall		Albany, N. Y.
Dorchester & Delaware			Cambridge, Md.
Dubuque South-Western	James Rollo	James Rollo	Farley, Iowa.
Dutchess & Columbia	W. G. Vanbuskirk	H. A. Webster	Fishkill, N. Y.
Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett	Dunkirk, N. Y.
E			
Eastern & Maine Central		J. P. Somerby	Salem, Mass.
Eastern & Maine Central	John Thompson		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L. Weaver	Riverton, Ky.
East-Tennesee, Virginia & Georgia	C. A. Hodge		Knoxville, Tenn.
Erie Railway	§§Frank K. Hain		Susquehanna, Pa.
Erie Railway	Robert Wallace		Susquehanna, Pa.
Erie Railway	V. Blackburn		Jersey City, N. J.
Erie Railway	F. M. Wilder	M. Wilder	Buffalo, N. Y.
Erie Railway	J. W. Chapman	J. W. Chapman	Hornellsville, N. Y.
Erie Railway	‖D. B. Goodell		Elmira, NY.
Erie Railway	‖J. B. Hill		Jersey City N. J.
Erie Railway	J. Van Vechten	‖J. Van Vechten	Port Jervis, N. Y.
Erie Railway	A. T. Back		Rochester, N. Y.
Erie & Pittsburg	G. J. Parkin	G. J. Parkin	Erie, Pa.
European & North Am. (of Maine)	A. O. Bailey	J. H. Brown	Oldtown, Maine.
Evansville & Crawfordsville	John L. White	Joseph Stiker	Evansville, Ind.
Evansville, Terre Haute & Chicago	§§Beriah Warren		Terre Haute, Ind.
F			
Fitchburg	Geo. A. Cooledge	Enos Varney	Charlestown, Mass.
Fitchburg & Worcester	John Webster	Samuel Stevens	Fitchburg, Mass.
Flint & Pere Marquette	Sanford Keeler	‖R. B. More	East-Saginaw, Mich.
Florida	Ezra Gray	G. Hernandez	Fernandina, Fla.
Flushing & North Shore	Wm. La Suer	C. Wilkinson	Hunter's Point, L. I.
Fort Wayne, Jackson & Saginaw		Lewis Colburn	Jackson, Mich.
G			
Galveston, Harrisburg & San Antonio	S. W. Tozer.		Harrisburg, Texas.
Galveston, Houston & Henderson	Jno. G. Coulon	Jno. G. Coulon	Galveston, Texas.
Georgia	William Hardman	T. M. Preval,	Augusta, Ga.
Gilman, Clinton & Springfield	W. B. McKenna		Clinton, Ill.
Grand Tower & Carbondale.	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk		Warren Noyes	Gorham, Me.
Grand Trunk	†Herbert Wallis	Wm. McWood	Montreal, Canada.
Grand Trunk.			Sherbrooke, Can.
Grand Trunk.		B. J. Mitchell	Portland, Me.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne, Ind.
Great Western of Canada	†John Ortton	F. Childs	Hamilton, Canada.
Green Bay & Lake Pepin	J. H. Erwin		Green Bay, Wis.
Greenville & Columbia	R. H. Anderson	R. H. Anderson	Helena, S. C.
H			
Hackensack & New-York	Abra'm Angausen		Hackensack, N. J.
Hanover Branch	John J. Bingley	Henry Britcher	Hanover, Pa.
Hannibal & St. Joseph	**Jno. MacKenzie		Hannibal, Mo.
Hartford, Providence & Fishkill	Edwin Garfield	V. D. Perry	Hartford, Ct.
Housatonic	C. R. Morris.	J. J. Ferris	Falls Village, Ct.
Houston & Texas Central	L. C. Noble	James McGee	Houston, Texas.
Huntington & Broad-Top Mountain	W. W. Coller	M. Tellerhoof	Saxton, Pa.
I			
Illinois Central	**S. J. Hayes	W. B. Snow	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia, Ill.
North Division	J. B. Edams		Amboy, Ill.
Iowa Division	Thomas W. Place		Waterloo, Iowa.
Illinois Midland	J. G. Clifford	G. Clifford	Paris, Ill.
Illinois & St. Louis	James Hazen		Bellville, Ill.
Indianapolis, Cincinnati & Lafayette	J. S. Patterson	S. Griffith	Cincinnati, Ohio.
Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Indianapolis & St. Louis	A. J. Sanborn		Mattoon, Ill.
Indianapolis, Bloomington & Western	**H. L. Cooper	A. J. Allen	Urbana, Ill.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ia.
International & Great Northern	R. B. Small		Palestine, Texas.
Intercolonial	Wm. Whitney	Edw. Shaffer	Moncton, N. B.
Iron	Perry Scott	Clem. Roetling	Ironton, Ohio.
Ithaca & Athens	F. A. Brown		Ithaca, N. Y.
J			
Jacksonville, Pensacola & Mobile	H. D. Kennedy		Jacksonville, Fla.
Jeffersonville, Madison & Indiana	Reuben Wells		Jeffersonville, Ind.
Junction & Breakwater	J. A. Maguire		Lewes, Del.
K			
Kalamazoo, Allegan & Grand Rapids			Kalamazoo, Mich.
Kansas City, St. Joseph & Council Bluff	Wm. D. Rowley	Wm. D. Rowley	St. Joseph, Mo.
Kansas Central	John Davis		Leavenworth, Kan.
Kansas Pacific	**L. H. Waugh	H. M. Roberts	Wyandotte, Kansas
Denver Pacific Div	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div.	**L. H. Waugh		Wyandotte, Kansas.
Junction City & Ft. Kearney Div	**L. H. Waugh		Wyandotte, Kansas.
Arkansas Valley Div	**L. H. Waugh		Wyandotte, Kansas.
Kentucky Central	J. R. Ledyard	J. L. Hackathorn	Covington, Ky.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Keokuk & Des Moines Valley	S. W. Wakefield	M. Sessions	Keokuk, Iowa.
King's Mountain	E. Thomas	E. Thomas	Chester, S. C.
Knox & Lincoln	§§E. R. Hamlin	Benj. Soule	Bath, Me.
Knoxville & Charleston			Knoxville, Tenn.
L			
Lackawanna & Bloomsburg	Chas. Graham	Chas. Graham	Kingston, Pa.
Lake Erie & Louisville	John Pero		Fremont, Ohio.
Lake Ontario Shore	Wm. Harris		Oswego, N. Y.
Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland, Ohio
Michigan Southern Division	Geo. W. Stevens		Elkhart, Ind.
" " "		S. S. Knapp	Adrian, Mich.
Toledo Division	J. M. Sanborn	Frank O. Bray	Norwalk, Ohio.
Erie Division	L. O. Gassett	J. Withyecombe	Cleveland Ohio.
Buffalo Division	W. L. Wallace	A. C. Robson	Buffalo, N. Y.
Lake Superior & Mississippi		John Hill	St. Paul, Minn.
Lehigh Valley	John I. Kinsey		South-Easton, Pa.
Lehigh Valley	P. Hofecker	E. R. Brown	Weatherly, Pa.
Lehigh Valley	John Campbell	Mauch Chunk, Pa.	Delano, Pa.
Lehigh Valley	D. Clark		Hazleton, Pa.
Leavenworth, Lawrence & Gal	J. S. McCrum		Lawrence, Kansas.
Little Rock & Fort Smith	James Eblin	D. R. Wing	Argenta, Ark.
London & Port Stanley			London, C. W.
Louisville, New-Albany & Chicago	Geo. Ruhlandt	Geo. Helfrich	New-Albany, Ind.
Long Island	Chs. A. Thompson	C. A. Thompson	Hunter's Point, L.I.
Louisville, Cincinnati & Lexington	S. S. Pilson	S. S. Pilson	Louisville, Ky.
Louisville & Nashville	†Thatcher Perkins	Isaac M. Owens	Louisville, Ky.
Louisville Division	D. P. Rennie		Louisville, Ky.
Clarksville Division	Jas. Montgomery		Bowling Green, Ky.
Nashville & Decatur Division	W. J. Steele		Nashville, Tenn.
South & North Ala. Div.	C. E. Slade	W. L. Gude	Birmingham, Ala.
Memphis & Ohio Div.	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Louisville, Paducah & So. Western	W. D. Robb	Frank Looney	Elizabethtown, Ky.
M			
Macon & Augusta			Macon, Ga.
Macon & Brunswick	R. Wagnon	R. Wagnon	Macon, Ga.
Macon & Western	D. M. Gogel	James A. Knight	Macon, Ga.
Maine Central	J. W. Philbrick	J. W. Philbrick	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div	John Ellis	C. H. Kenison	Augusta, Me.
Maine Central Division	John F. Merrill		Waterville Me.
Manchester & Lawrence	Chas. L. Eastman	M. W. Dickerman	Concord, N. H.
Marietta, Pittsburg & Cleveland	W. J. Adams		Marietta, Ohio.
Marietta & Cincinnati	E. M. Bosley	E. M. Bosley	Chillicothe, Ohio.
Marquette, Houghton & Ontonagon	C. J. Shellhorn	H. D. Lyons	Marquette, Mich.
Maryland & Delaware	Samuel Peters		Greensboro, Md.
Memphis & Little Rock	Tho. Rennell	P. Twitchell	Argenta, Ark.
Memphis & Charleston	A. Ross	A. W. Drew	Memphis, Tenn.
Memphis & Charleston	H. N. Burford	Fabien Varin	Huntsville, Ala.
Mineral Point	Robert Hay	Robert Hay	Mineral Point, Wis.
Mineral Range	C. H. Fox		Hancock, Mich.
Mississippi & Tennessee	Geo. Haszinger	J. Riny	Memphis, Tenn.
Michigan Central	§§Geo. S. Chalender	Geo. S. Chalender	Jackson, Mich.
Michigan Central		Henry Whiting	Detroit, Mich.
Midland Pacific	A. C. Stiles		Lincoln, Neb.
Mississippi Valley & Western	J. S. Pickering		Canton, Mo.
Missouri, Iowa & Nebraska	J. G. Crozier		Alexandria, Mo.
Missouri, Kansas & Texas	T. G. Gorman		Parsons, Kan.
Missouri, Kansas & Texas		J. Townsend	Sedalia, Mo.
Missouri, Kansas & Texas	J. E. Wiggins		Hannibal, Mo.
Missouri River, Fort Scott & Gulf	John S. McCrum	Alex. Montier	Kansas City, Mo.
Mobile & Montgomery	James McFarland	L. Barham	Montgomery, Ala.
Mobile & Girard	C. D. Wall		Girard, Ala.
Mobile & Ohio		John McHugh	Mobile, Ala.
Mobile & Ohio	R. McDougal	I. T. Booth	Whistler, Ala.
Mobile & Ohio	B. S. Herring		Macon, Miss.
Mobile & Ohio	R. H. Briggs		Jackson, Tenn.
Montgomery & Eufaula	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Algiers, La.
Montreal Northern Colonization	§§C. G. C. Simpson		Montreal, Can.
N			
Nashville & Chattanooga	John U. Eastman	J. G. Sawyer	Nashville, Tenn.
Naugatuck	Henry Hanford	George W. Gray	Bridgeport, Ct.
New-Bedford	G. W. Reynolds	John L. Gibbs	New-Bedford, Mass.
New-Brunswick	P. Logan	C. M. Kinnon	Fredericton, N. B.
New-Brunswick & Canada	Tho. Armstrong	G. Houlton	St. Andrew's, N. B
New-Haven & Northampton	Henry Fox	Henry Fox	New-Haven, Ct.
New-Jersey Midland	Duane Searle		Wortendyke, N.J.
New-Jersey & New-York	A. J. Auryansen		Jersey City, N. J.
New-Jersey Southern	Rufus Blodgett		Manchester, N. J.
New-Orleans, St. Louis & Chicago	‡‡——. Allen		McComb City, Miss.
New-Orleans, St. Louis & Chicago	§§L. H. Sellars		Water Valley, Miss.
New-Orleans, St. Louis & Chicago		G. H. White	McComb City, Miss.
New Orleans & Mobile	§Josiah Bettis	W. J. Henderson	Mobile, Ala.
New-York, Kingston & Syracuse	A. Q. Mackenbush	G. Dikeman	Syracuse, N. Y.
New-York & Harlem	Wm. M. Strong	C. E. Garey	New-York.
New-York Central & Hudson River		††Leander Garey	New-York.
New-York Central Division	‡G. B. Van Vorst	D. Hoit	West-Albany, N. Y.
New-York Central Division	Henry Watkeys.		Syracuse, N. Y.
New-York Central Division	Amos Gould	James Leary	Rochester, N. Y.
New-York Central Division	Jas. Butman	Wm. Johnson	Buffalo, N. Y.
New-York Central Division	S. L. White	George Rowe	Niagara Falls, N. Y
Hudson River Division	‡Wm. Buchanan	E. A. Olmstead	New-York City.
Hudson River Division	R. Greenalch	J. J. Conaghty	E. Albany, N. Y.
New-York, Boston & Montreal	W. G. Van Buskirk	H. A. Webster	Dutchess Junc., N.Y
New-York & Oswego Midland	§§W. A. Dripps		Oswego, N. Y.
Eastern Division	J. Minchell		Middletown, N. Y.
Middle Division	Tho. Howard		Norwich, N. Y.
Northern Division	Edward Van Vleck	T. D. Day	Oswego, N. Y.
New-York & New-England	Geo. E. Boyden	Elias E. Pratt	Boston, Mass.
New-York, Providence & Boston	Jas. H. Anderson	Jas. H. Anderson	Providence, R. I.
New-York, New-Haven & Hartford	§§H. Kittendorf	James Denver	New-Haven, Ct.
New-York, New-Haven & Hartford	E. S. Brewer	F. Leppens	Hartford, Ct.
Northern Central	G. W. Rhodes		Baltimore, Md.
Northern Central	James Strode	G. W. Demarest	York, Pa.
Northern New-Hampshire	James W. Lander	Albert Langmaid	Concord, N. H.
Northern of Canada	P. Clark.	P. Clark	Toronto, Can.
Northern Pacific	**H. A. Towne		Brainerd, Minn.
Minnesota Division	W. H. Lewis	W. S. Heathcote	Brainerd, Minn.
Dakota Division	C. W. Rossiter		Fargo, D. T.
Pacific Division	J. F. Curtis		Kalama, W. T.
North-Carolina	Rufus D. Wade	B. G. Sergeant	Co. Shops, N. C.
North-Louisiana & Texas	C. H. Tull		Monroe, La.
North-Pennsylvania	Franklin Roop	Franklin Roop	Philadelphia, Pa.
North-Eastern	D. W. Haines	A. M. Corrie	Florence, S. C.
Norwich & Worcester	Richard Colburn	G. R. Bentley	Norwich, Ct.
O			
Ohio & Mississippi		G. Hibbert	Cochran, Ind.
Ohio & Mississippi	‡J. D. W. Potts		Seymour, Ind.
Oil City & Pithole	George Thompson		Pithole, Pa.
Oil Creek & Alleghany River	H. J. Bookhammer	John Monks	Oil City, Pa.
Old Colony & Newport	J. K. Taylor	A. Gleason	Boston, Mass.
Oregon & California	§§J. Brandt.		Portland, Oregon.
Owensburg & Russellville	J. R. Osborne		Owensburg, Ky.
P			
Paducah & Memphis	J. S. Mackay		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Panama	Chas. E. Stewart		Aspinwall, N. G.
Pacific of Missouri	§§John Hewitt	J. Hodge	St Louis, Mo.
Pennsylvania	§§T. N. Ely		Altoona, Pa.
Pennsylvania	H. D. Garrett	I. W. Van Houten	W. Philadelphia, Pa.
Pennsylvania	E. L. Caum	Samuel W. Myers	Harrisburg, Pa.
Pennsylvania	G. W. Strattan	John P. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver	R. S. Ramsey	Pittsburg, Pa.
New-Jersey Division	L. A. Bosdevex		Meadow Shops, N. J.
New-Jersey Division		David H. Baker	Jersey City, N. J.
West-Penn. Division	C. B. Street	M. H. Fales	Blairsville, Pa.
Peoria & Rock Island	Geo. Gregg		Peoria, Ill.
Peoria, Pekin & Jacksonville	R. F. Hurd	R. F. Hurd	Pekin, Ill.
Petersburg & Weldon	R. B. Andrews	Alex. Wright	Petersburg, Va.
Philadelphia, Wilmington & Baltimore	S. A. Hodgman.	Wm. Lundgren	Wilmington, Del.
Philadelphia & Baltimore Central	S. D. Danfield	Samuel D. Danfield.	Chester, Pa.
Philadelphia and Erie	Martin Walls		Sunbury, Pa.
	W. L. Forster		Renovo, Pa.
	W. L. Holman		Kane, Pa.
	W. T. Smith.		Erie, Pa.
	§§Howard Fry		Erie, Pa.
Philadelphia & Reading	L. B. Paxson	Aaron Steinbach	Reading, Pa.
Germantown & Norris'n Div.	Jackson Richards		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis	E. Pierce	D. F. Andregg	Dennison, Ohio.
Pittsburg & Columbus Division		Thos. D. Furgusen.	Steubenville, Ohio.
Little Miami Division		M. P. Ford	Columbus, Ohio.
Little Miami Division	J. H. Setchel	John McVay	Cincinnati, Ohio.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlin	Columbus, Ohio.
Col., Cin. & Ind. Division	Geo. H. Prescott	Geo. H. Prescott	Logansport, Ind.
Pittsburg, Fort Wayne & Chicago	S. M. Cummings	John Marquis	Allegheny, Pa.
Pittsburg, Fort Wayne & Chicago	J. M. Boon.	Israel Lee	Fort Wayne, Ind
Pittsburg, Fort Wayne & Chicago		J. J. Kirkland	Crestline, Ohio.
Pittsburg, Virginia & Charlston	W. Lininger		Pittsburg, Pa.
Pittsburg, Washington & Baltimore	§Wm. Stearns		Connellsville, Pa.
Pittsburg, Washington & Baltimore	J. E. Sampsel	J. M. Leach	Pittsburg, Pa.
Portland & Rochester	John G. Brady	John G. Brady	Portland, Me.
Portland & Oxford Central	Geo. W. Battles	Geo. W. Battles	Buckfield, Me.
Portland, Saco & Portsmouth	John Donnell		Portland, Me.
Port Royal	Geo. Riley	J. H. Milton	Augusta, Ga.
Port Hope, Lindsay & Beaverton	H. G. Taylor	H. G. Taylor	Port Hope, Can.
Portsmouth, Gt. Falls & Monmouth	James Tucker	E. Fall	Union Village, N.H.
Poughkeepsie & Eastern	John L. Driscoll	Jerry Wigg	Poughkeepsie, N. Y.
Providence & Worcester	Joseph Kelly	Olney L. Smith	Providence, R. I.
Providence, Warren & Bristol	Rufus Smith	J. Brightman	Bristol, R. I.
Q			
Quincy, Alton & St. Louis	J. O. Gravell	W. G. Gilbert	Quincy, Ill.
Quincy, Missouri & Pacific	W. F. Smith	W. F. Smith	Kirksville, Mo.
R			
Raleigh & Gaston	B. R. Harding	B. R. Harding	Raleigh, N. C.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Richmond, Fredericksburg & Potomac	H. Kuhn	W. H. Trainham	Richmond, Va.
Richmond, Danville & Piedmont	John McFarland	J. B. Vaughan	Richmond, Va.
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond, Va.
Richmond & York River	C. H. Harris	J. L. Thompson	Richmond, Va.
Rive De Loup	P. A. Logan	C. R. McKinnin	Fredericton, N. B.
Rome, Watertown & Ogdensburg	Abram Klohs	H. H. Sessions	Rome, N. Y.
Rome, Georgia	O. W. Harbin	O. W. Harbin	Rome, Ga.
Rochester & Genesee Valley	M. E. Brown	M. Wilder	Buffalo, N. Y.
Rockford, Rock Island & St. Louis	Joseph Elder	T. F. Nolte	Beardstown, Ill.
S			
Saginaw Valley & St. Louis	W. S. Thompson		Saginaw, Mich.
San Antonio & Mexican Gulf	W. T. Bingham		Victoria, Texas.
Savannah & Charleston	P. J. Hutson	J. D. Murphy	Charleston, S. C.
Seaboard & Roanoke	§§M. M. Pendleton		Portsmouth, Va.
Selma & Gulf	Wm. T. Daughtrey		Selma, Ala.
Selma, Rome & Dalton		W. W. Peirce	Selma, Ala.
Selma, Marion & Memphis	Dolphus Gay		Marion, Ala.
Sheboygan & Fond du Lac	John Hickey	John Hickey	Sheboygan, Wis
Sioux City & Pacific	C. H. Foster		Missouri Val., Iowa.
Southern Pacific of California	J. P. Wilson	F. N. Bellisle	San Francisco, Cal.
South-Carolina	W. B. Smith	John Reed	Charleston, S. C.
Southern Central	Chas. G. Brown	H. Mooney	Auburn, N. Y.
Southern, of Long Island	Mark Brear	C. Wilkinson	Brooklyn, N. Y.
Southern Minnesota			Wells, Minn.
South-Western of Georgia	C. D. Wall		Columbus, Ga.
South-Western of Georgia	D. M. Gogel	James A. Knight	Macon, Ga.
South Side of Long Island	A. P. Doane	A. P. Doane	Williamsburg, L.
Spartanburg & Union	J. N. Benner	Jacob Rice	Union C. H., S. C.
Springfield, Athol & Northeastern	W. E. Granger		Springfield, Mass.
Stanstead, Shefford & Chambly	W. H. Smith		Waterloo, C. E.
Stockton & Ione		W. T. Hoyt	Stockton, Cal.
Stonington & Providence	J. H. Anderson	J. H. Anderson	Providence, R. I.
St. Croix & Penobscot	Edward Bolton	A. G. Page	Milltown, Me.
St. Joseph & Denver City	E. Sleppy		St. Joseph, Mo.
St. Lawrence & Ottawa	Calvin Dame	Calvin Dame	Prescott. Canada.
St. Louis, Iron Mountain & Southern	O. A. Haynes	Oscar Doolittle	Carondelet, Mo.
Arkansas Division	L. Finlay	L. Finlay	Little Rock, Ark.
St. Louis, Vandalia, T. Haute & Ind.	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Indianapolis Division	Wm. Riley		Terre Haute, Ind.
Vandalia Division	A. J. Sanborn.		Effingham, Ind.
St. Louis, Alton & Terre Haute	**Beriah Warren		St. Louis, Mo.
St. Louis, Salem & Little Rock	I. I. Upchurch		Steelville, Mo.
St. Louis & South-Eastern	‖L. B. Salisbury		Mt. Vernon, Ill.
Nashville Division	‖E. M. Hamstone		Edgefield, Tenn.
St. Paul & Pacific	J. C. Monroe	T. W. Heathcote	St. Paul, Minn.
St. Paul & Sioux City	F. C. Butterfield	J. W. Lydic	Shakopee, Minn.
St. Louis, Kansas City & Northern	W. H. Selby	C. S. Buck	Moberly, Mo.
St. Louis, Lawrence & Western	J. A. Hagan.		Lawrence, Kan.
Sullivan & Erie			Tonawanda, Pa.
Syracuse, Binghamton & New-York	H. H. Dawson	David Burling	Syracuse, N. Y.
Syracuse Northern	W. Garrison	L. W. Smith	Syracuse, N..
T			
Tennessee & Pacific	William McKeand.	William McKeand.	Nashville, Tenn.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	J. A. Hanglin		Marshall, Texas
Tioga	Peres Bonny	D. H. Stratton	Blossburg, Pa.
Toledo, Peoria & Warsaw	W. O. Hewitt	R. M. Hemphill	Peoria, Ill.
Toledo, Wabash & Western	§J. B. Morse		Fort Wayne, Ind
Toledo, Wabash & Western	‖John C. Wills.		Lafayette, Ind.
Toledo, Wabash & Western	Jacob Johann		Springfield, Ill.
Toledo, Wabash & Western		U. H. Kohler	Toledo, Ohio.
Toronto, Grey & Bruce	Wm. Bowstead		Toronto, Can
Toronto & Nipissing	J. Haggus.		Toronto, Canada.
Troy & Boston	Foster Church	R. V. Coon	Troy, N. Y.
U			
Union Pacific	§I. H. Congdon	‡‡Geo. E. Stevens	Omaha, Nebraska.
Eastern Division		‖A. M. Collett	Omaha, Neb.
Eastern Division		‖H. P. Makely.	Grand Island, Neb.
Mountain Divison		‖Jno. E. Davis	Cheyenne, W. T.
Laramie Division		‖Floyd Heavaner	Laramie, W. T.
Western Division		‖C. A. Phipps	Evanston, U. T.
Utah Central	Thos. Pierpont	Thos. Pierpont	Salt Lake City.
Utica & Black River	John Bailey	David James	Utica, N. Y.
Utica, Chenango & Susquehanna	C. H. Brown		Utica, N. Y.
V			
Vermont & Massachusetts		Jacob Marsh	Fitchburg, Mass.
Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.
Virginia & Truckee	Wm. Bowker		Carson, Nev.
W			
Wash. City, Va. Midland & Gr. Southern	Jas. E. Waddey	J. T. Nalls	Alexandria, Va.
Washington & Ohio	Edward Dunn	Joshua Harrison	Alexandria, Va
Welland	James Taylor	James Chase	St. Catharine, C. W.
Westchester & Philadelphia	John Moyer	N. Pawling	Philadelphia, Pa.
Western & Atlantic	John H. Flynn	Wm. Grambling	Atlanta, Ga.
Western Maryland	Wm. Lannan	J. H. Nussear	Union Bridge, Md.
Western North-Carolina	J. D. Hollister	J. D. Hollister	Salisbury, N. C.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Western of Alabama	John McVey	F. M. Wade	Montgomery, Ala.
Western R. R. N. C	M. W. Atkinson	M. W. Atkinson	Fayetteville, N. C.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
West-Feliciana	J. A. Tilton	Wm. McKelvey	Woodville, Miss.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
West-Wisconsin	Matt Ellis	J. C. Fischer	Hudson, Wis.
White Water Valley	A. W. Britton		Harrison, Ohio.
Wilmington, Columbia & Augusta	W. H. Turrintine		Wilmington, N. C.
Wilmington & Weldon	John Bissit	C. R. Clowe	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Winona & St. Peter	F. C. Ford	F. C. Ford	Winona, Minn.
Wisconsin Central	G. Campbell	J. L. Adams	Stevens' P't, Wis.
Worcester & Nashua	Albert Griggs	Albert Griggs	Worcester, Mass

DIRECTORY
OF
Railway Superintendents and Purchasing Agents
THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director. ‡ Ass't. Gen. Supt. § Ass't Supt

A

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Adirondack	C. H. Ballard		Saratoga, N. Y.
Alabama Central	John M. Bridges		Selma, Ala.
Albany & Susquehanna	*C. F. Young		Honesdale, Pa.
Allegheny Valley	David McCargo	John L. Awl	Pittsburg, Pa.
Arkansas Central	James A. Tappan		Helena, Ark.
Atchison, Topeka & Santa Fe	C. F. Morse	C. F. Morse	Topeka, Kansas.
Atchison & Nebraska	J. F. Barnard	J. F. Barnard	St. Joseph, Mo.
Atchison & Nebraska	*Geo. H. Nettleton		Kansas City, Mo.
Alabama & Chattanooga	C. H. Stanton	T. J. Carlile	Meridan, Miss.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Ashtabula, Ohio.
Atlanta & Richmond Air Line			Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	J. H. Holway	Meadville, Pa.
First Division	J. T. Odell		Meadville, Pa.
Second Division	A. L. Dunbar		Meadville, Pa.
Third and Fourth Division	T. A. Phillips		Galion, Ohio.
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.

B

Baltimore & Ohio	Thos. R. Sharp	Benj. Williams	Baltimore, Md.
Ohio & Chicago Divisions	W. C. Quincy		Columbus, Ohio.
Baltimore & Potomac	Geo. C. Wilkins	A. W. Sumner	Baltimore, Md.
Bangor & Piscataquis	M. H. Angel	L. H Eaton	Bangor, Maine.
Boston, Barre & Gardner	I. N. Ross		Worcester, Mass.
Boston & Albany	*Wm. Bliss		Boston, Mass
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & Providence	A. A. Folsom	A. A. Folsom	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood		Fitchburg, Mass.
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A. Dodge	Lyon & Vose	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood	Boston, Mass.
Boston, Lowell & Nashua	J. B. Winslow		Boston, Mass.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Brunswick & Albany	C. L. Schlatter		Brunswick, Ga.
Burlington & Missouri River (in Neb.)	Wm. Irving		Omaha, Neb.
Burlington, Cedar Rapids & Minnesota	W W. Walker	S. L. Dows	Cedar Rapids, Ia.
Burlington & South-Western	R. T. Hosford	O. W. Owen	Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	David McCargo	N. M. Whitside	Pittsburg, Pa.

C

Cairo & St. Louis	J. L. Hinkley	C. Ritsema	St. Louis, Mo.
Cairo & Vincennes	Henry L. Morrill		Cairo, Ill.
Camden & Atlantic	F. A. Lister	J. L. Wendell	Camden, N. J.
Canada Central, Brockville, & Ottawa	H. P. Alden		Brockville, Can.
Canada Southern	*L. D Rucker		Toledo, Ohio.
Canada Southern	W. Snyder	E. W. Porter	St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua, Pa.
Cayuga Lake	J. L. Grant		Ithaca, N. Y.
Central Branch Union Pacific	W. F. Downs	W. F. Downs	Atchison, Kan.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Central Pacific	‡John Corning		Sacramento, Cal.
Western Division	E. C. Fellows		Lathrop, Cal.
Visalia Division	E. C. Fellows		Lathrop, Cal.
Truckee Division	Frank Free		Wadsworth, Nev.
Humboldt Division	R. S. Matteson		Carlin, Nevada.
Oregon Divison	J. A. Fillmore		Sacramento, Cal.
Sacramento Division	J. A. Fillmore		Sacramento, Cal.
Salt Lake Division	R. H. Pratt		Ogden, Utah.
California Pacific Division	A. D. Wilder		Vallejo, Cal.
Central Vermont	J. W. Hobart		St. Albans, Vt.
Western Division	John Schrier		Ogdensburg, N. Y.
Central & Southern Division	Ambrose Arnold		St. Albans, Vt.
Northern & Eastern Division	G. L. Stone	"	"
Rutland Division	J. Burdett		Rutland, Vt.
Harlem Extension Division	J. Burdett		Rutland, Vt.
New-London Northern	G. W. Bentley		New-London, Ct.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	M. S. Dunn	J. A. Netherland	Richmond, Va.
Middle Division	H. D. Chapin		Staunton, Va.
Charlotte, Columbia & Augusta	James Anderson		Columbia, S. C.
Cheshire	R. Stewart	H. H. Stone	Keene, N. H.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt	R. W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	J. B. Mulliken		Escanaba, Mich.
Madison Division	C. A. Swineford		Baraboo, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver		Clinton, Iowa.
Western Iowa Division	John A. Head		Boone, Iowa.
Chicago & Alton	J. C. McMullen	A. V. Hartwell	Chicago. Ill.
Chicago, Burlington & Quincy	R. Harris	D. B. Sibley	Chicago, Ill.
Chicago Burlington & Quincy	‡C. H. Hudson		Chicago, Ill.
Eastern and Middle Division			Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota	C. Harris	F. I. Massey	Dubuque, Iowa.
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	*Geo. S. Bowen	James Penny	Chicago, Ill.
Chicago & Pacific	J. M. Whitman		Chicago, Ill.
Chicago & Paducah			Streator, Ill.
Chicago, Rock Island & Pacific	Hugh Riddle	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chicago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.
Chicago & Michigan Lake Shore	*Geo. C. Kimball	Wm. R. Morrison	St. Joseph, Mich.
Chicago, Danville & Vincennes	L. Pearson		Chicago, Ill.
Chicago, Milwaukee & St. Paul	*S. S. Merrill	J. J. Slocum	Milwaukee, Wis.
Chicago, Pekin & Southwestern	W. P. Sisson		Streator, Ill.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Chicago & Canada Southern	D. Edwards		Toledo, Ohio.
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.
Cincinnati, Richmond & Chicago	Lewis Williams		Cincinnati, Ohio
Cincinnati & Martinsville	T. C. Burnside		Franklin, Ind.
Cincinnati & Terre Haute			Terre Haute, Ind.
Cin., Cumberland Gap & Charleston	W. J. Taylor		Knoxville, Tenn.
Cincinnati Hamilton & Dayton	Lewis Williams	P. Hickey	Cincinnati, Ohio.
Cincinnati, Hamilton & Indianapolis	Lewis Williams		Cincinnati, Ohio.
Cincinnati, Lafayette & Chicago	E. H. Waldron	G. G. Hadley	Lafayette, Ind.
Cincinnati, Sandusky & Cleveland	*D. W. C. Brown		Sandusky, Ohio.
Cincinnati, Sandusky & Cleveland	Chas. Howard		Springfield, Ohio.
Cleveland, Columbus, Cincinnati & Ind	E. S. Flint		Cleveland, Ohio.
Indianapolis Division	C. C. Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Cleveland, Mt. Vernon & Delaware	G. A. Jones		Mt. Vernon, Ohio.
Cleveland, Tuscarawas Val. & Wheeling	*E. B. Thomas	W. W. Card, *Supt*	Cleveland, Ohio.
Colorado Central	P. J. Nichols		Golden, Col.
Columbus & Hocking Valley	M. M Green		Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H.E.Chamberlin	H. E. Chamberlin	Concord, N. H.
Connecticut River	John Mulligan	John Mulligan	Springfield, Mass.
Connecticut & Passumpsic Rivers	Geo. A. Merrill	Geo. Killey	Lyndonville, Vt.
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Corning, Cowanesque & Antrim	A. H. Gorton	R. J. Burnham	Corning, N. Y.
Cumberland Valley	J. F. Boyd	J. F. Boyd	Chambersburg, Pa.
Cumberland & Pennsylvania	J. A. Millholland		Mt. Savage, Md.

D

Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	J. R. Meckling	J. R. Meckling	Sioux City, Iowa.
Davenport & St. Paul	N. H. Wood		Davenport, Iowa.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware & Hudson Canal Co.	*C. F. Young		Honesdale, Pa.
Albany & Susq. Division	C. D. Hammond		Oneonta, N. Y.
Rensselaer & Saratoga Div	Theo. Voorhees		Troy, N. Y.
Delaware, Lackawanna & Western		G.W. B. Cushing	New-York City.
Delaware, Lackawanna & Western	W. F. Hallstead		Scranton, Pa.
Lack. & Bloomsburg Div	D. T. Bound		Kingston, Pa.
Morris & Essex Division	Andrew Reasmer		Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus. Division	W. F. Hallstead		Utica, N. Y.
Denver & Rio Grande	W. W. Borst	W. S. Jackson	Denver, Col.
Detroit and Milwaukee	W. K. Muir	John S. Lorimer	Detroit, Mich.
Detroit, Hillsdale & Indiana	W. F. Parker		Ypsilanti, Mich.
Detroit, Eel River & Illinois	A. B. Southard		Logansport, Ind.
Detroit, Lansing & Lake Michigan	J. B. Mulliken	C. D. Childs	Detroit, Mich
Dorchester & Delaware	J. M. Murphy		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer	C. V. DeForest	Fredonia, N. Y.
Dubuque & South-Western	J. P. Farley		Dubuque, Iowa
Dutchess & Columbia	C. L. Kimball		Dutchess J'n, N. Y.

E

East Alabama & Cincinnati	B. Boyle		Opelika, Ala.
East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern	Geo. Bachelder		Boston, Mass.
Eastern & Maine Central	*C. F. Hatch	C. W. Pratt	Boston, Mass.
Erie & Pittsburg	J. M. Kimball		Erie, Pa
Erie Railway,	E. S. Bowen	C. H. Bowman	New-York City.
Erie	P. P. Wright		Jersey City, N. J.
Eastern Division	E. O. Hill		Port Jervis, N. Y.
Delaware Division	Benj. Thomas		Port Jervis, N. Y.
Rochester Division	M. E. Brown		Rochester, N. Y.
Susquehanna Div.	C. W. Gardner		Elmira, N. Y.
Buffalo Division	R. G. Taylor		Buffalo, N. Y.
Western Division	J. S. Beggs		Buffalo, N. Y.
Erie & Pittsburg	*J. D. Layng	Wm. Mullins	Pittsburg, Pa.
European & North-American	M. H. Angell	M. H. Angell	Bangor, Maine.
Evansville & Crawfordsville	John E. Martin		Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.

F

Fitchburg	Chas. L. Heywood	John Adams	Boston, Mass.
Flint & Pere Marquette	*H. C. Potter	Geo. C. Cook	East-Saginaw, Mich.
Flushing & North-Side	I. D. Barton		Hunter's Point, L. I.
Flushing & North-Side		A. E. Godeffroy	New-York City.
Fort Wayne, Jackson & Saginaw	P. B. Loomis		Jackson, Mich.
Fort Wayne, Muncie & Cin	W. W. Worthington		Fort Wayne, Ind.

G

Galveston, Harrisburg & San Antonio	Hardy Eddins	J. W. Pierce	Galveston, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Geneva, Ithaca & Athens	R. A. Packer		Ithaca, N. Y.
Georgia	S. K. Johnson	John Vaughn	Augusta, Ga.
Gilman, Clinton & Springfield	D. H. Conklin		Springfield, Ill.
Grand Gulf & Port Gibson	G. W. McGinnis		Port Gibson, Miss,
Grand Rapids & Indiana	Wm. O. Hughart		Grand Rapids, Mich.
S. Division	J. M. Matheany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich.
Grand Rapids & Indiana	*W. O. Hughart	William Mullins	Pittsburg, Pa.
Grand Trunk	*J. Hickson	John Taylor	Montreal, Canada.
East Division	Henry Bailey		Montreal, Canada.
West Division	W. J. Spicer		Toronto, Canada.
Grand Tower and Carbondale		Wm. W. Harris	Grand Tower, Ill.
Great Southern of Ga. & Fla	M. H. Alberger		Jacksonville, Fla.
Great Western (Canada)	Andrew Watson	Robert Beatty	Hamilton, Ont.
Green Bay & Minnesota	S. B. Kenrick		Green Bay, Wis.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.

H

Hannibal & St. Joseph	C. N. Lee	C. N. Lee / W. J. Hilton	Hannibal, Mo.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin	D. S. Draper	Bridgeport, Ct
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	C. A. Burton		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top.	Geo. F. Gage	B. A. Knight	Huntingdon, Pa.

I

Illinois Central	Jos. F. Tucker		Chicago, Ill.
Illinois Central.	*Jas. C. Clarke	O. Ott	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois Midland	D. Hitchcock	‡P. Campbell	Terre Haute, Ind.
Illinois & St. Louis	W. K. McComas		St. Louis, Mo.
Indianapolis, Bloomington & Western	C. C. Smith		Indianapolis, Ind.
Indianapolis, Bloomington & Western	Geo. B. Wright, Receiver		Indianapolis, Ind.
Indianapolis, Cincinnati & Lafayette	Geo. L. Barringer	E. V. Cherry	Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna		Indianapolis, Ind.
Indianapolis & Vincennes		Wm. Mullins	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward	J. W. Morse	St. Louis, Mo.
Indianapolis, Peru & Chicago	E. C. Murphy	D. Macy	Indianapolis, Ind.
Michigan City Division	E. C. Murphy		La Porte, Ind.
Intercolonial Railway	Lewis Carvell	Sam. Watson	Moncton, N. B.
International & Great Northern	H. M. Hoxie		Palestine, Texas.

J

Jacksonville, North-Western & S. E.	E. S. Greenleaf		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	Robert Walker		Jacksonville, Fla.
Jeffersonville, Madison & Indianapolis		Wm. Mullins	Pittsburg, Pa.
Jeffersonville, Madison & Indianapolis	*D. W. Caldwell		Columbus, Ohio.
Jefferson, Madison & Indianapolis,	Horace Scott		Louisville, Ky.
Junction & Breakwater	Tho. Groom		Lewes, Del.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
K			
Kansas Central	W. R. Martin		Leavenworth, Kan.
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard	J. F. Barnard	St. Joseph, Mo.
Kansas City, St. Joseph & Council Bluffs	*Geo. H. Nettleton		Kansas City, Mo.
Kansas Midland	W. W. Fagan		Topeka, Kan.
Kansas Pacific	O. S. Lyford		Kansas City, Mo.
Kansas Pacific	O. S. Lyford	J. L. Woods	St. Louis, Mo.
Kaw Valley Division	O. H. Dorrance		Lawrence, Kan.
Smoky Hill Division			Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col.
Kentucky Central	G. H. Pendleton	Geo. P. Bowler	Covington, Ky
Keokuk & Des Moines Valley	Geo. H. Griggs	G. E. Kilbourne	Keokuk, Iowa.
Knox & Lincoln	C. A. Coombs	Oliver Morse	Bath, Maine.
L			
Lackawanna & Bloomsburg	D. T. Bound		Kingston, Pa.
Lake Erie & Louisville	I. H. Burgoon		Fremont, Ohio.
Lake Ontario Shore	E. A. Van Horne		Oswego, N. Y.
Lake Superior & Mississippi	G. H. Smith	C. F. Cruft	St. Paul, Minn.
Lake Shore & Michigan Southern	Charles Paine	A. C. Armstrong	Cleveland, Ohio.
Kalamazoo Division	William Wheaton		Kalamazoo, Mich.
Leavenworth, Lawrence & Galveston	B. S. Henning		Lawrence, Kan.
Leavenworth, Lawrence & Galveston	*Geo. H. Nettleton		Kansas City, Mo.
Lawrence & South-Western	R. B. Gemmell	R. B. Gemmell	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
Lehigh Valley		L. Chamberlin	Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa
Mahony Division	James I. Blakslee		Mauch Chunk, Pa.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	T. Hartman		Little Rock, Ark.
Logansport, Crawfordsville & S. W.			Terre Haute, Ind.
Long Island	G. W. N. Custis		Hunter's Point, L. I.
Louisville & Nashville & G. Southern	Albert Fink	G. C. Breed	Louisville, Ky.
Clarksville Division	Jas. Montgomery		Bowling Green, Ky.
Memphis Division	J. T. Flynn		Memphis, Tenn.
Nashville & Decatur Division	James Geddes		Nashville, Tenn.
So. & North Ala. Division	Robert Meek		Birmingham, Ala.
Louisville, Cin. & Lexington	J. McLeod	J. McLeod	Louisville, Ky.
Louisville, New-Albany & Chicago		J. R. Parker	New-Albany, Ind.
Louisville, Paducah & Southwestern	D. F. Whitcomb	D. F. Whitcomb	Louisville, Ky.
M			
Macon & Brunswick	John A. Grant		Macon, Ga.
Macon & Western	Capt. G. I. Foreacre		Atlanta, Ga.
Maine Central	*Chas. F. Hatch		Boston, Mass.
Maine Central	Payson Tucker		Portland, Me.
Androscoggin Division	A. Brown		Lewiston, Me.
Manchester & Lawrence	H. E. Chamberlin		Concord, N. H.
Marietta & Cincinnati	W. W. Peabody	S. L. Campbell	Cincinnati, Ohio.
Marietta, Pittsburg & Cleveland	Jas. McArthur	R. B. Hoover	Marietta, Ohio.
Marquette, Houghton & Ontonagon	*Samuel Schoch	Jas. S. Mott	Marquette, Mich.
Maryland & Delaware	J. L. Caldwell	J. L. Caldwell	Easton, Md.
Memphis, Carthage & North-Western	E. H. Brown		Carthage, Mo.
Memphis & Little Rock	W. E. Smith	W. E. Smith	Memphis, Tenn.
Memphis & Charleston	W. J. Ross		Memphis, Tenn.
Michigan Central	W. B. Strong		Chicago, Ill.
Michigan Central	‡J. R. Ledyard	Allan Bourn	Detroit, Mich.
Grand River Valley Division	C. B. Bush		Jackson, Mich.
Air-Line, So. Bend & Joliet	E. C. Brown		Jackson, Mich.
Bay City Division	T. B. Sargent	D. A. Waterman	Detroit, Mich.
Jackson. Lansing & Saginaw Div.	C. B. Bush		Jackson, Mich.
Michigan Lake Shore	D. P. Clay, *receiver*		Grand Rapids, Mich.
Midland Railway of Canada	H. G. Taylor		Port Hope, Ont.
Midland Pacific	J. N. Converse	M. A. Showers	Nebraska City, Neb.
Milwaukee, Lake Shore & Western	H. G. H. Reed		Milwaukee, Wis.
Mineral Point	G. W. Cobb	G. W. Cobb	Mineral Point, Wis.
Mineral Range	J. H. Macdonald		Hancock, Mich
Mississippi & Tennessee	M. Burke	M. Burke	Memphis, Tenn.
Mississippi Valley & Western	Guy Wells		Quincy, Ill.
Missouri, Iowa & Nebraska	Col. Henry Hill		Warsaw, Ill.
Missouri, Kansas & Texas	C. H. Chappel		Sedalia, Mo.
Missouri, Kansas & Texas	A. B. Garner	G. M. Babcock	Sedalia, Mo.
Cherokee Division	L. H. Sheldon		Parsons, Kansas.
Choctaw Division	S. G. Eddy		Dennison, Texss.
Missouri Division	J. J. Frey		Sedalia, Mo.
Sedalia Division	J. J. Frey		Sedalia, Mo.
Neosho Division	L. H. Sheldon		Parsons, Kansas.
Osage Divsion	C. M. Sheafe		Holden, Mo.
Missouri Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Missouri River, Fort Scott & Gulf	B. S. Henning	A. H. Campbell	Kansas City, Mo.
Missouri River, Fort Scott & Gulf	*Geo. H. Nettleton		Kansas City, Mo.
Mobile & Ohio	*A. L. Rives		Mobile, Ala.
Alabama Division	J. S. Walker		Mobile, Ala.
Mississippi Division	E. S. Hosford		Macon, Miss.
Tenn. & Ky. Division	Cecil Fleming		Jackson, Tenn.
Mobile & Girard	W. L. Clark		Columbus, Ga.
Mobile & Montgomery	G. Jordon	G. Jordon	Montgomery, Ala.
Montgomery & Eufaula	B. Dunham	B. Dunham	Montgomery, Ala.
Morgan's Louisiana & Texas		C. A. Whitney & Co.	New-Orleans, La.
N			
Nashville, Chattanooga & St. Louis	J. W. Thomas		Nashville, Tenn.
Naugatuck	G. W. Beach		Bridgeport, Ct.
New-Brunswick & Canada		Tho. H. Street	St. Andrews, N. B.
New-Brunswick & Canada	John Stewart		St. Stephens, N. B.
New-Bedford & Taunton	Warren Ladd		New-Bedford, Mass.
New-Haven & Derby	E. S. Quintard		New-Haven, Ct.
New-Haven & Northampton	C. N. Yeamans	C. N. Yeamans	New-Haven, Ct.
New-Haven, Middletown & Willimantic	W. A. Waterbury	W. A. Waterbury	Middletown, Ct
New-Jersey & New-York	W. D. Beasley		Jersey City, N. J.
New-Jersey Midland	W. E. Lewis	R. H. Chipman	Wortendyke, N. J.
New-Jersey Southern	*W. S. Sneden		Long Branch, N. J
New-Orleans & Selma	T. H. Du Puy		Selma, Ala.
New-Orleans, St. Louis & Chicago	*E. D. Frost	S. H. Edgar, V. P.	New-Orleans, La.
New-Orleans & Mobile	D. B. Robinson	John J. Howell	Mobile, Ala.
New-York & Harlem	Chas. M. Bissell	R. C. Moore	New-York, N. Y.
New-York, New-Haven & Hartford	E. M. Reed	R. N. Dowd	New Haven, Ct.
N. Y. & N. H. Division	John T. Moody		New-York, N. Y.
Hartford Division	C. S. Davidson		Hartford, Ct.
Shore Line Division	W. H. Stephenson		New-Haven, Ct.
New-York, Boston & Montreal	C. L. Kimball		Dutchess Jn., N. Y.
New-York Central & Hudson River	J. Tillinghast		Albany, N. Y.
Hudson River Division	J. M. Toucey	C. V. DeForest	New-York.
Eastern Division	Zenas C. Priest		Utica, N. Y.
Syracuse & Rochester Division	G. H. Burrows		Syracuse, N. Y.
New-York & New-England	H. A. G. Pomeroy	W. W. McKim	Boston, Mass.
Worcester Division	P. St. M. Andrews		Worcester, Mass.
New-York & Oswego Midland			New-York, N. Y.
New-Jersey Division	G. W. N. Custis		Jersey City, N. J.
Middle Division	H. M. Flint		Middletown, N. Y.
Western Division			Oswego, N. Y.
New-York, Kingston & Syracuse	F. J. Hecker		Rondout, N. Y.
New-York, Providence & Boston	A. S. Matthews	A. S. Matthews	Stonington, Ct.
New Brunswick	Tho. Hoben	W. R. Logan	Fredericton, N.B.
Northern Pacific	*C. W. Mead	E. F. Williams	St. Paul, Minn.
Minnesota Division	J. H. Sullivan		Brainerd, Minn.
Northern Pacific Division	*J. W. Sprague		Kalama, W. T.
Lake Superior & Miss. Division	George H. Smith		St. Paul, Minn.
North-Pennsylvania	S. W. Roberts	F. A. Cornby	Philadelphia, Pa.
Northern Canada	†F. W. Cumberland		Toronto, Can.
Northern Central	*Frank Thomson	A. W. Sumner	Philadelphia, Pa.
Northern (New-Hampshire)	George E. Todd		Concord, N. H.
North-Eastern (South-Carolina)			Charleston, S. C.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
O			
Ohio & Mississippi	*A. N. Chrystie		St. Louis, Mo.
Oil Creek & Alleghany River	C. J. Hepburn		Pittsburg, Pa.
Old Colony	J. R. Kendrick		Boston, Mass.
Omaha & North-Western	J. E. House		Omaha, Neb.
Oregon & California	J. Brandt, Jr.		Portland, Oregon.
P			
Paducah & Memphis	M. Burke		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Paris & Danville	B. F. Matthius		Danville, Ill.
Passumpsic	G. A. Merrill		Lyndonville, Vt.
Pennsylvania	G. Clinton Gardner		Altoona, Pa.
Pennsylvania	*Frank Thomson	Enoch Lewis	Philadelphia, Pa.
New-Jersey Division	F. Wolcott Jackson		Jersey City, N. J.
Philadelphia Division	W. F. Lockard		Philadelphia, Pa.
Middle Division	J. N. McCrea		Harrisburg, Pa.
Pittsburg Division	Rob't Pitcairn		Pittsburg, Pa.
Tyrone Division	S. S. Blair		Tyrone Pa.
Bedford Division	S. M. Prevost		Bedford, Pa.
West Pennsylvania Division	J. McC. Creighton		Allegheny City, Pa.
Pennsylvania & New-York Canal	A. Mitchell		Wilkesbarre, Pa.
Pensacola & Louisville	C. S. Williams		Pensacola, Fla.
Peoria & Rock Island	John R. Hilliard		Peoria, Ill.
Peoria & Rock Island	*W. R. Hamilton	W. R. Hamilton	Peoria, Ill.
Peoria, Pekin & Jacksonville	John Allen	John Allen	Pekin, Ill.
Petersburg	R. A. Bacon	W. P. Taylor	Petersburg, Va.
Philadelphia & Reading	J. E. Wootten	W. S. Wilson	Philadelphia, Pa.
Catawissa & Williamsport Br'ch	D. C. Reinhart		Williamsport, Pa.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Lebanon & Tremont	H. W. Tracy		Pine Grove, Pa.
Philadelphia and Baltimore Central	Henry Wood	Henry Wood	Philadelphia, Pa.
Philadelphia & Erie	W. A. Baldwin		Williamsport, Pa.
Philadelphia & Erie		Enoch Lewis	Philadelphia, Pa.
Western Division	J. W. Reynolas		Erie, Pa.
Middle Division	Edmund L. Tyler		Renovo, Pa.
Eastern Division	Thomas Gucker		Williamsport, Pa.
Philadelphia, Wilmington & Baltimore	H. F. Kenney		Philadelphia, Pa.
Pithole Valley	J. T. Odell		Pithole City, Pa.
Pittsburg, Cincinnati & St. Louis	S. M. Felton, Jr	Wm. Mullins	Pittsburg, Pa.
Pittsburg & Cin. Division	S. M. Felton, Jr		Pittsburg, Pa.
Little Miami Division	J. D. Ellison		Cincinnati, Ohio.
Indianapolis & C. Division	D. W. Caldwell		Columbus, Ohio.
Pittsburg, Washington & Baltimore	E. K. Hindman		Connellsville, Pa.
Pittsburg, Ft. Wayne & Chicago	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Eastern Division	George Webb		Pittsburg, Pa.
Western Division	C. D. Gorham		Fort Wayne, Ind.
Port Royal	R. G. Fleming		Augusta, Ga.
Portland & Ogdensburg	J. Hamilton	John E. Donnell	Portland, Maine.
Portland & Rochester	W. H. Turner	W. H. Turner	Portland, Maine.
Portsmouth, Great Falls & Conway	J. W. Sanborn		Portsmouth, N. H.
Portsmouth	H. E. Chamberliu		Concord, N. H.
Poughkeepsie & Eastern	J. A. Perkins	A. W. Cable	Poughkeepsie, N Y
Providence & Worcester	W. D. Hilton	W. D. Hilton	Providence, R. I.
Providence, Warren & Bristol	Waterman Stone		Providence, R. I.
Q			
Quincy, Alton & St. Louis	N. J. T. Dana	N. J. T. Dana	Quincy, Ill.
Quincy, Missouri & Pacific	J. R. Buchanan		Quincy, Ill.
R			
Raleigh & Gaston	A. B. Andrews	A. B. Andrews	Raleigh, N. C.
Richmond, York River & Chesapeake	E. F. Folger	Hugh Graham	Richmond, Va.
Richmond & Danville	T. M. R. Talcott		Richmond, Va.
Richmond, Fred. & Potomac	E. T. D. Myers	T. L. Courtney	Richmond, Va.
Richmond & Petersburg	Augustus Shaw		Richmond, Va.
Rockford, Rock Island & St. Louis	W. H. Ferry, Receiver	A. E. Lyford	Rock Island, Ill.
Northern Division	Henry Looseley		Rock Island, Ill.
Southern Division	Geo. L. Walker		Beardstown, Ill.
Rome, Watertown & Ogdensburg	J. W. Moak		Watertown, N. Y.
S			
St. Lawrence & Ottawa	R. Luttreil		Prescott, Can.
St. Joseph & Denver City	*L. D. Tuthill		St. Joseph, Mo.
St. Paul & Pacific	E. Q. Sewell	E. C. Becker	St. Paul, Minn
St. Paul & Sioux City	J. F. Lincoln	J. F. Lincoln	St. Paul, Minn.
St. Louis, Alton & Terre Haute	W. G. Broughton		St Louis, Mo.
St. Louis, Iron Mountain & Southern	Arthur W. Soper	W. S. Cuddy	St. Louis, Mo.
St. Louis, Iron Mountain & Southern	*A. W. Soper		St. Louis, Mo.
St. Louis & South-Eastern	*E. F. Winslow	A. G. Thompson	St. Louis, Mo.
St. Louis Division	George S. Winslow		Mt. Vernon, Ill
Nashville Division	R. H. G. Minty		Henderson, Ky.
St. Louis, Kansas City & Northern	W. R. Arthur	R. W. Green	St. Louis, Mo.
St Louis Division	W. H. Vaughan		St. Louis, Mo.
Western Division	C. L. Dunham		Kansas City, Mo.
St. Louis, Vandalia, Terre Haute & Ind.	John E. Simpson	C. R. Peddle	Indianapolis, Ind.
St. Louis, Lawrence & Western	E. C. Devereaux		Lawrence, Kan.
St. Louis, Salem & Little Rock	J. W. Blanchard	H. A. Crawford	St. Louis, Mo.
Sacramento Valley & P. & S. V	F. A. Bishop		Sacramento, Cal.
Saginaw Valley & St. Louis	N. M. Merrill.	N. M. Merrill.	Saginaw, Mich.
San Francisco & Northern Pacific	A. A. Bean	F. H. Gudes	Petaluma Cal.
San Rafael & San Quentin	David Nye		San Rafael, Cal.
Savannah & Charleston	C. S. Gadsden		Charleston, S. C.
Seaboard & Roanoke		E. G. Ghio	Baltimore, Md.
Selma, Marion & Memphis	E. W. Rucker	E. W. Rucker	Marion, Ala.
Selma, Rome & Dalton	M. Stanton		Selma, Ala.
Sheboygan & Fond du Lac	L. A. Emerson	L. A. Emerson	Fond du Lac. Wis.
Shenango & Allegheny	I. T. Blair		Greenville, Pa.
Sioux City & Pacific	L. Burnett	L. Burnett	Missouri Valley, Ia.
Sodus Point & Southern	H. Van Vleck		Sodus Point, N. Y.
South-Shore	J. R. Kendrick		Boston, Mass.
South Carolina	S. S. Solomon	A. Mitchell	Charleston, S. C.
Southern Central	Jas. G. Knapp		Auburn, N. Y.
Southern, of Long Island	I. D. Barton		Hunter's Point, L.I.
Southern, of Long Island		A. E. Godeffroy	New-York City.
Southern Minnesota	W. C. Van Horne		Wells, Minn.
Southern Pacific of California	A. N. Towne		Sacramento, Cal.
North Division	A. C. Bassett		San Francisco, Cal.
Los Angeles Division	E. E. Hewitt		San Francisco, Cal.
Southwestern of Georgia	Virgil Powers		Macon, Ga.
Spartanburg & Union	W. W. Davies		Spartanburg, S. C.
Springfield Athol & Northeastern	John W. Phelps		Springfield, Mass.
Springfield & North-Western	*A. J. Ware		Pekin, Ill.
Staten Island	J. W. Wilbur		New-York, N. Y.
Stockton & Ione	W. G. Miller		Stockton, Cal.
Stonington & Providence	A. S. Mathews	A. S. Mathews	Stonington, Ct.
Sullivan & Erie	Wm. Stevenson		Towanda, Pa.
Summit County	W. M. Riter		Coalville, Utah.
Syracuse Northern	C. B. Morse		Syracuse, N. Y
Syracuse, Binghamton & New-York	T. Voorhees		Syracuse, N. Y.
T			
Tennessee & Pacific	George Maney		Nashville, Tenn.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	Geo. H. Noble		Marshall, Texas
Tioga	L. H. Shattuck		Blossburg, Pa.
Toledo, Peoria and Warsaw	A. L. Hopkins, *Receiver*		Peoria, Ill.
Western Division	David K. Smith		Peoria, Ill.
Western Division	William E. Dorwin		Warsaw, Ill.
Toledo, Wabash & Western	Robert Andrews	J. T. Sterling	Toledo, Ohio.
Eastern Division	K. H. Wade		Lafayette, Ind.
Western Division	C. W. Bradley		Springfield, Ill.
Toledo, Canada Southern & Detroit	D. Edwards		Toledo, Ohio.
Troy & Boston	C. W. Moseley		Troy, N. Y.
Toronto, Grey & Bruce	N. Weatherston	W. Watson	Toronto, Can.

Car Manufacturers.

Allison, W. C. & Sons	Philadelphia Pa.
Allegheny Car & Transportation Co	Swissvale, Pa.
Altoona Manufacturing Co	Altoona. Pa.
Adrian Car Co	Adrian. Mich.
Arlington Car Manufacturing Co.	Arlington, Vt.
Barney & Smith Manufacturing Co	Dayton, Ohio.
Baker, Jackson & Co	Latrobe, Pa.
Bellefonte Car Manufacturing Co.	Bellefonte, Pa.
Billmeyer & Smalls	York, Pa.
Bradley, Osgood	Worcester, Mass.
Bridgeport Car-Works	Bridgeport, Pa.
Brill, J. G. & Co	Philadelphia, Pa.
Buffalo Car Co	Buffalo, N. Y.
Canada Car Co	Toronto, Canada.
Canda, F. E. & Co	Chicago, Ill.
Cape Fear Building Co	Abbottsburg, N. C.
Cartersville Car Co	Cartersville, Ga.
Central Car & Manufacturing Co	Jackson, Mich.
Clendenning, W. W	Montreal.
Cummings Car-Works	Jersey City, N. J.
Connellsville Machine and Car Co	Connellsville, Pa.
De Pere Iron-Works	De Pere, Wis.
Detroit Car-Works	Detroit, Mich.
Dawson Manufacturing Co	Dawson, Ga.
Dickey, Neill & Co	Toronto.
Dickson Manufacturing Co	Scranton, Pa.
Erie Car-Works	Erie, Pa.
Elmira Car-Works	Elmira, N. Y.
Frederick & Co	Catasauqua, Pa.
Freas Brothers & Thornton	Berwick, Pa.
Gardner, F. & Co.	Carlisle, Pa.
Gill, John L	Columbus, Ohio.
Gilbert, Bush & Co	Troy, N. Y.
Goold, James & Co	Albany, N. Y.
Goodrich Car Co	Augusta, Ga.
Hannibal Car Works	Hannibal, Mo.
Harris, J. & Co	St. John, N. B.
Harrisburg Car Manufacturing Co	Harrisburg, Pa.
Haskell & Barker Car Co	Michigan City, Ind.
Heathcote, Herbst & Co	Glen Rock, Pa.
Hamilton, William & Son	Toronto.
Harlan & Hollingsworth Co	Wilmington, Del.
Herrick Car-Works	Oswego, N. Y.
Huntingdon Car-Works	Huntingdon, Pa.
Indiana Car Co	Cambridge City, Ind.
Jackson & Sharp Co	Wilmington, Del.
Jackson & Woodin Manufacturing Co	Berwick, Pa.
Jones, J. M. & Co	West-Troy, N. Y.
Kimball Manufacturing Co	San Francisco, Cal.
Keith, H. T. & I. N	W. Sandwich, Mass.
Laporte Car Manufacturing Co	Laporte, Ind.
Lombard, Thomas	Augusta, Me.
Lebanon Manufacturing Co	Lebanon, Pa.
Lehigh Car Manufacturing Co	Stemton, Pa.
Litchfield Car Manufacturing Co	Litchfield. Ill.
Mansfield Machine-Works	Mansfield, Ohio.
Michigan Car Co	Detroit, Mich.
McNairy, Claflen & Co	Cleveland, Ohio.
Murray, Dougall & Co	Milton, Pa.
McVay, Walker & Co	Braddock's Field, Pa.
Mowry Car and Wheel Works	Cincinnati, O.
Middletown Car & Manufacturing Co	Middletown, Pa.
Missouri Car and Foundry Co	St. Louis, Mo.
Myers, H. S. & Co. (small cars)	York, Pa.
National Car Co	St. Albans, Vt.
New-Haven Car Co	New-Haven, Ct.
Niblo, James M	Conshohocken. Pa.
Ohio Falls Car Co	Jeffersonville, Ind
Ontario Car Co	London, Ont.
Oxford Co-operative Car Co	Oxford, Pa.
Patten Car-Works	Bath, Maine.
Peabody & Crangle Bro's	Calais, Me.
Peters, Simon	Quebec.
Petersburg Car Co	Petersburg, Va.
Pittsburg Car-Works	Pittsburg, Pa.
Pittsburg and McKeesport Car Co	McKeesport, Pa.
Pittsburg Car and Locomotive Co	Pittsburg, Pa.
Portland Co	Portland, Me.
Pullman Car Co	Chicago and Detroit.
Peregoy, J. H	Houston, Texas.
Ranlet Car Manufacturing Co	Laconia, N. H.
Russell & Co	Massillon, Ohio.
Sands, William L	Pottstown, Pa.
Schall, Michael	York, Pa.
Schenectady Car-Works	Schenectady, N. Y.
Shaaber & Johnston	Reading, Pa.
South-Western Car Co	Jeffersonville, Ind.
Shoenberger & Bryant	Duluth, Minn.
Seath & Hager	Terre Haute, Ind.
St. Charles Manufacturing Co	St. Charles, Mo.
Stephenson, John & Co	New-York, N. Y.
Star Mining & Manufacturing Co	Henderson, Ky.
Taunton Car Co	Taunton, Mass
Tredegar Co	Richmond. Va.
Watsontown Car Co	Watsontown, Pa.
Wharton, Thomas J	Brunswick, Ga.
Wason Manufacturing Co	Springfield, Mass
Weimer, P. L. & Bros	Lebanon, Pa.
Wyoming Valley Manufacturing Co	Wilkesbarre, Pa.
Wells, French & Co	Chicago, Ill.
Wilmington Car-Works	Wilmington, Del.

Car-Wheel Manufacturers.

Albany Car-Wheel Works	Albany, N. Y.
American Paper Car-Wheel Co	Hudson, N. Y.
Atlantic Iron-Works	Portsmouth, Va.
Baltimore Car-Wheel Foundry Co	Baltimore, Md.
Barnum Richardson Manufacturing Co	Chicago, Ill.
Barnum Richardson Co	Lime Rock, Conn.
Barney & Smith Manufacturing Co.	Dayton, Ohio.
Bass & Hanna	Fort Wayne, Ind.
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Boston Car-Wheel Co	Camb'gep't, Mass.
Bowler, Mayer & Brayton	Cleveland, Ohio.
Cayuta Wheel & Foundry Co.,	Waverly, N. Y.
Chicago Car-Wheel Co	Chicago, Ill.
Davenport, Fairbairn & Co	Erie, Pa.
Dawson Manufacturing Co	Dawson, Ga.
Detroit Car-Wheel Works	Detroit, Mich.
Ensign Manufacturing Co	Huntingdon, W. Va.
Fulton Foundry Co	Cleveland, Ohio.
Gill, John L. Jr	Allegheny City, Pa.
Green's Car-Wheel Manufacturing Co	St. Louis, Mo.
Hamtramck Car-Wheel Works	Detroit, Mich.
Harris, J. & Co	St. John, N. B.
Harrisburg Car Manufacturing Co	Harrisburg, Pa.
Haskell & Barker Car Co	Michigan City, Ind.
Heartt, Jonas S. & Co	Troy, N. Y.
Jackson & Woodin	Berwick, Pa.
John L. Gill	Columbus, Ohio.
Lehigh Car-Wheel & Axle Works	Catasauqua, Pa.
Litchfield Car M'f'g Co	Litchfield, Ill.
Lobdell Car-Wheel Works	Wilmington, Del.
London Car-Wheel Co	London, Can.
Louisville Car-Wheel & Railway Supply Co	Louisville, Ky.
Middlebrook & Mack	Oswego, N. Y.
Missouri Car and Foundry Co	St. Louis, Mo.
Mowry Car and Wheel Works	Cincinnati, Ohio.
Nash, John & Co	Cincinnati, Ohio.
Ohio Falls Car Co	Jeffersonville, Ind.
Parker & Bailey	St. Paul, Minn.
Pettengill. Glass & Co	Cleveland, Ohio.
Ramapo Wheel & Foundry Co	Ramapo, N. Y.
Russell, B. F. & Co	Chicago, Ill.
Rutland Foundry & Machine Co	Rutland, Vt.
Sterling Car-Wheel Foundry	Columbus, Ohio.
Scoville, J. & N. C	Buffalo, N. Y.
St. Louis Car-Wheel Co	St. Louis, Mo.
Taylor Iron Works	High Bridge, N. J.
Thompson, Duglas	Bordentown, N. J.
Tredegar Company	Richmond, Va.
Toronto Car-Wheel Co	Toronto, Can.
Washburn, Hunts & Co	Jersey City, N. J.
Washburn Car-Wheel Manufacturing Co	Worcester, Mass.
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Grant Locomotive Works	Paterson, N. J.
Hinckley Locomotive Works	Boston, Mass.
Manchester Locomotive Works	Manchester, N. H.
Mason, William	Taunton, Mass.
McKay Iron and Locomotive Works	Jersey City, N J.
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Pittsburg Locomotive Works	Pittsburg, Pa.
Rogers Locomotive Works	Paterson, N. J.
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Buffalo Steam Gauge & Lantern Co.

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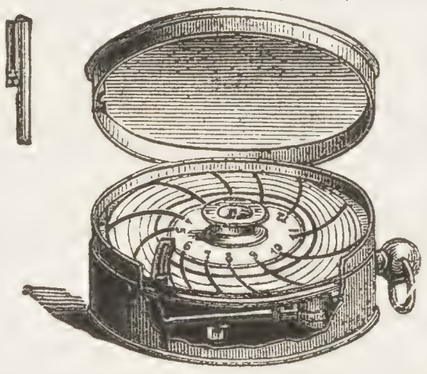
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Reflectors Re-plated, Gauges of all kinds and Locomotive Balances Repaired at Short Notice.

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U. S. Patents, December 28, 1869; April 22, 1873; August 2, 1874 October 20, 1874; November 10, 1874.



These Detectors are the latest and most complete invented. They are portable and reliable time-pieces and guaranteed in every case to be perfect. They can be cleaned and repaired by any watch-maker, and are invaluable and indispensable to all establishments that employ watchmen, as it enables them to check and control their movements. **Price,** with 12 keys (for 12 stations), **$75.**

N. B.—We will protect our customers against all claims of other patentees, and especially against J. E. Buerk, of Boston, Mass., who has never brought suit for any alleged infringement by clocks made under the above-named patents, and by us offered for sale. Send for Circular to

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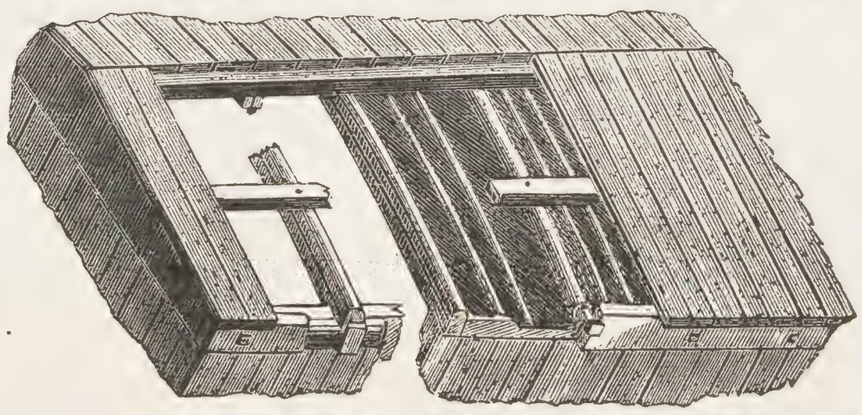
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WINSLOW IRON CAR ROOF.



Office, 211 Superior Street.

MANUFACTORY,

No. 39 Union Street,

CLEVELAND, OHIO.

Over 40,000 Cars now in service covered with this roof. It will last, without repairing, as long as the car it covers, and is more economical by one half than any roof in use.

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Winona & St. Peter	S. Sanborn		Madison, Wis.
Winona & St. Peter		R. W. Hamer	Chicago, Ill.
Wisconsin Central	E. B. Phillips		Milwaukee, Wis.
Worcester & Nashua	C. S. Turner.	C. S. Turner.	Worcester, Mass.



HAWKES' PATENT FOUNTAIN PEN-HOLDER.

Fits any Pen. Rubber, $2, $2.50, $3.50, and $4.

GEO. F. HAWKES, 66 Nassau Street, New-York.

Noyes' Patent Liquid Cooler and Packing.

For Cooling Railroad Car and Steamboat Journals, and Bearings of all kinds, and for Mixing with other Oils.



The attention of those who are running heavy journals is respectfully invited to the above Liquid Cooler. It has been successfully used for upward of two years, and is constantly growing in favor, as its merits become known, and we are confident that practical men can not fail of being convinced that our preparation deserves their candid attention. What we claim for it is:

That it will Cool a Hot Journal when in Motion,

and extinguish the flame when the box is on fire; that its use will, in a great measure, prevent the occurrence of a hot journal, and save the expense, delays, and annoyances incident thereto; that it will eliminate the heat from a journal at a temperature greatly below the point required to melt the babbitt, preventing an accumulation of heat, and by a timely application save it from destruction; that its non-inflammable elements (where waste is used) permeate the waste and prevent its taking fire; that it keeps the journal smooth and polished, preventing unnecessary friction; that its combination is based upon true scientific principles, which renders it impossible to fail in its results, and is

The only Preparation that will Cool a Hot Journal

while it is in motion, as attested by certificates below; that one thorough application on a hot journal will do more execution in cooling than the constant application of water for half an hour, besides doing it evenly and without loss of time.

Every Railroad or Steamboat

should have a can of the Liquid Packing on board, with the directions for its use pasted upon it, and thus always have at hand the means of effectually cooling a hot journal, and thereby avoid the expense, danger, and trouble from this cause.

AN EXCELLENT AND DURABLE LUBRICATOR

can also be made by combining with the Liquid Cooler and Packing certain quantities of oil, according to the season of the year in which it is to be used, as set forth in the directions. The combination produces a soft, heavy body, that is very essential in hot weather. The Liquid also keeps oil sweet, by preventing oxidation, and its value is greatly enhanced by the additional body which it acquires; and, considering the increased durability, it will be found a matter of considerable economy to combine the Liquid and oil together.

This preparation will be found especially valuable for Steamships, and it has been a leading idea in its combination to especially adapt it for their use. There is, however, no class of machinery, where heavy bearings are used, where it can not be employed beneficially and economically.

On Railroads where Black oil is used as a lubricator exclusively, mixed as directed, especially in warm weather, it will be found a great improvement, and fully equal to lard oil, making a considerable percentage of saving in cost, lessening the liability of hot boxes; and animal oil can be entirely discarded, even in warm weather, and as good results obtained, with less expense, as where all animal oil is used.

The Liquid Cooler and Packing is put up in two forms, one for journals not using waste-packing, such as Steamships, etc., the other for journals on Railroad cars, etc. *In ordering, be particular to state which class of work it is required for.*

We manufacture suitable cans for using the Liquid Packing. Send for circulars containing full description and instruction for use.

WHAT RAILROAD MEN SAY OF IT.

Boston, Lowell and Nashua R.R. Superintendent's Office,
Boston, April 13, 1874.

P. Noyes, Agent:

Dear Sir: We have been using your Liquid Cooler and Packing, and consider it one of the best articles for cooling off hot boxes that we have ever been acquainted with. All of our trains are supplied with a can of it. John B. Winslow, *Supt.*

Person Noyes, Esq., East Cambridge, Mass., March 4, 1874.
Agent Belt and Leather Stuffing Co.:

Dear Sir: In reply to your inquiry in regard to Liquid Cooler and Packing, allow me to say:

I have just sent in a requisition for three barrels, which I trust you have received before this. I will only say in recommending it, that it is the best article I have ever used, and our conductors and engineers all indorse my sentiments.

I have ordered eighteen more cans, which I think will meet your approbation. I intend to have one on every train, and on long trains two, and have them made with inch nozzles, and a cap attached by chain, to prevent thickening; also a packing-iron about fourteen inches long, attached to a slot in the can, to be used in stirring up the Liquid, and also for drawing the waste out on the front side, and crowding it in on the back side, before putting the packing in. This little packing-iron I find very essential, as it is always at hand, and will prevent delay in searching for a suitable article in times of emergency. Yours truly,
JOHN F. CROCKETT, *M. M., Boston, Lowell, and Nashua R. R.*

Person Noyes, Esq.,
Agent Belt and Leather Stuffing Co.: Chicago, Dec. 10, 1873.

Dear Sir: The barrel Liquid Packing sent on trial is approved, and you will please send us five barrels more. Yours, H. I. HIGGINS, *Purchasing Agent C., B., and Q. R. R.*

Chicago, March 23, 1874.

P. Noyes, Agent: Please forward to C., B., & Q. R. R., and send bill of same to this office, eight barrels of Liquid Packing and Cooler, same as purchased of you before, and send as soon as possible. H. I. HIGGINS, *Purchasing Agent.*

Agent Belt and Leather Stuffing Co.: Chicago, Ill., May 7, 1874.

Dear Sir: You will please forward to the C., B., and Q. R. R. ten barrels Liquid Packing.
H. I. HIGGINS, *Purchasing Agent C., B., and Q. R. R.*

Mr. Noyes: Fitchburg, Mass., Aug. 20, 1872.

Dear Sir: I have used your Liquid Packing for the past four months, and am perfectly wer-satisfied that it is the most effectual article ever in use for the purpose claimed. I have just ordered another barrel. If all railroad companies would adopt your Liquid Cooler, I think they would find a saving of nearly 20 per cent, when used with mineral or black oil, according to your directions. JACOB MARSH, *Master Car Builder, Troy and Greenfield R. R.*

Mr. P. Noyes: Salem, Mass., Aug. 7, 1872.

Dear Sir: I have been using your Liquid Packing for cooling car journals, for some time past, and have been well pleased with it. I have had occasion to use it a number of times under Pullman Cars, and it has been a complete remedy in every case of hot journals.

Every train should be provided with it, as it is a saving of time and expense in the running of trains, provided it is applied and cared for according to directions for using.
J. P. SOMERBY, *M. C. B. of Eastern Railroad.*

P. Noyes, Esq: Albany, Nov. 1, 1872.

Dear Sir: I received the barrel of Liquid Cooler and Packing you sent me for trial, and gave it out to our most experienced conductors, to use according to directions. Below please find their report:

"We, the undersigned, Freight Conductors on the Eastern Division of the N. Y. C. & H. R. R. R., have used the Liquid Cooler furnished by Mr. Jones, and find that when we arrive at a station with a hot journal, the Liquid Packing cools it sufficiently by the time we arrive at the next station to use the black oil, and then have no trouble in getting through with it. It is the best we ever used.—R. H. Fisher, A. W. Getmans, R. H. Heath, Wm. Hess, Conductors E. Div., N. Y. C. R. R. I. Ferguson, Conductor H. R. R. R."
JOSEPH JONES, *M. M., N. Y. C. & H. R. R. R., E. Div.*

CERTIFICATES OF NAVAL OFFICERS.

[COPY.]
Bureau of Steam Engineering,
Navy Department,
Washington, April 12.

Chief Engineer's Office,
U. S. Navy Yard, Washington, March 30, 1875.

Commodore Thos. H. Patterson,
U. S. N., Commandant:

Sir: In obedience to your order of December 24, 1874, to test the Liquid Cooler of Person Noyes, of Boston, Mass., and report upon the results, I respectfully submit the following:

This Liquid is a composition possessing both lubricating and cooling qualities, and when mixed with other oils, gives it more body and prevents oxidation.

The test was made upon a journal 9½ inches in diameter and 14 inches long, making seventy revolutions per minute. The journal was rough and in bad condition at the commencement of the test, and was allowed to become hot; the Liquid was applied and in a few minutes it was reduced to a good working condition. Several experiments were made, all with equally favorable results. The Liquid can be mixed with other oils, or, in extreme cases, with fresh or salt water, the latter being preferable, as it amalgamates more readily with the Liquid, which at the same time retains its lubricating qualities. It is very efficient for cooling hot journals, and the cost is about one half that of sperm oil.

The Castor Oil Belt Dressing is an excellent article for preserving belts. It protects the surface from the atmosphere, keeps them pliable, and makes them adhere closely to the pulley, and more durable. Very respectfully, your ob't serv't,
(Signed) EDWARD FITHIAN, *Chief Engineer, U. S. N.*

Person Noyes, Agent: Boston, April 15, 1875.

Dear Sir: I have been using your Liquid Cooler for some six months past, and can say of it that in all respects it is far superior to any thing of the kind I have ever used. After having tried many cooling mixtures, down even to cold water, upon one of our engine bearings, without success, your Cooler has worked a complete change, to our entire satisfaction. I also find that with one third of your Liquid and two thirds oil, it has the desired effect of keeping cool bearings and lubricating them perfectly at the same time. In some extreme cases it may be expedient to use more than one third of the Liquid. With what experience I have had, I find it the best article for all bearings, and use the same on all machinery in my department. Would cheerfully recommend it to all parties who have charge of machinery for economy and durability, and, both afloat and ashore, engineers will find it of great benefit to them.

I have also tried your Castor Oil Belt Dressing on my belts, and consider it the best article for softening and preserving the leather that I have ever used.

Yours, most truly,
THOS. J. MARSTON, *Navy Yard, Boston.*

P. Noyes,
Agent Belt and Leather Stuffing Co.: Boston, April 15, 1875.

Sir: I have had in use for some time past, your Liquid Cooler, and having given it a thorough trial, I can say that I regard it as being the best article for cooling a hot journal that I have ever used. I have tried it on thrust bearings, which is the worst place for heat that I have on board ship, and it cooled it down splendidly. I find by mixing one part of your Cooler with about two parts lard oil that my anxiety was lessened considerably, after having it in use forty-eight hours, regarding hot bearings. By attention to mixing and stirring, it will cool down the bearing. I save about one third by mixing Liquid Cooler with lard oil. I would recommend any one to try it, both for its economy and cooling properties.

Yours, very truly,
A. MORRISON, *Chief Engineer Steamship Carroll.*

Send for a Barrel. No charge unless it does all we state.

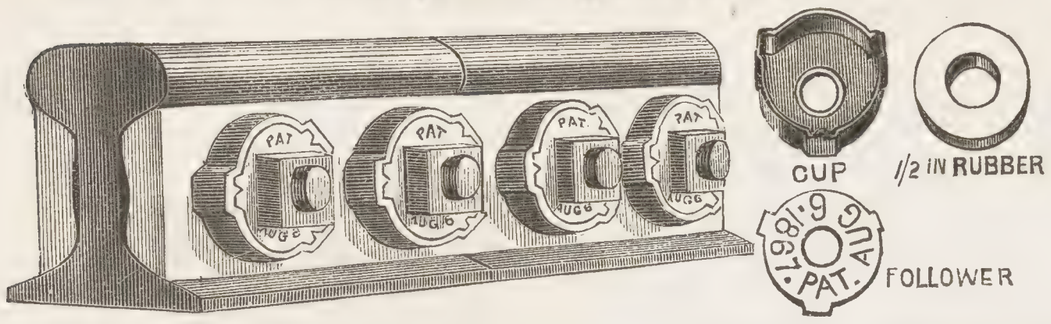
Manufactured by the Belt and Leather Stuffing Co.,

47 INDIA STREET, BOSTON.

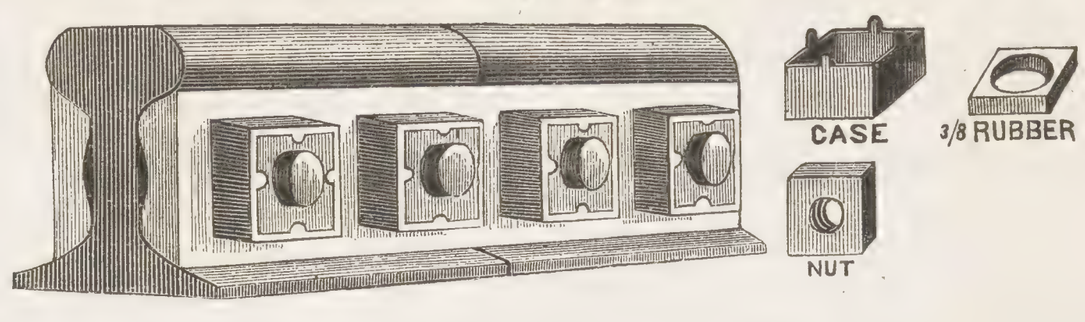
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PRATT'S PATENT COMPENSATING FISH-PLATE JOINTS.

"SPRING CUP-WASHER."



"SPRING NUT."



Track Bolts and Nuts are constantly subjected to a vibration and jar. One large item of expense is for wrench-work and replacement of bolts and nuts already off.

Most of the contrivances for removing this trouble are failures. They do not remove the cause of the trouble. This can only be done by some elastic material, which will absorb the vibration and prevent its reaching the nuts. Experience proves that permanent elasticity can not be obtained by using wood, which is perishable, or steel, which can not be made of uniform temper. In our inventions, the elastic packing of rubber between the nut and the plate absorbs the jar or vibration, insulates the nut, and by removing the cause of the trouble removes the trouble itself. Among its advantages are these:

1st. It saves the expense of wrench-work and loss of nuts.
2d. The rubber absorbs the blow given by the wheels at the joint, in such manner as to prevent fracture of rails at the joint, and accidents resulting therefrom.
3d. The track is made noiseless.
4th. Rails are saved from pounding out at the ends, and the thread of the bolts and nuts from stripping.

The practical value of these inventions is more fully demonstrated by the two million joints now long in use.

Manufactured and Sold by

THE PRATT MANUFACTURING COMPANY,

NO. 71 BROADWAY, NEW-YORK,

Manufacturers and Dealers in all kinds of RAILWAY TRACK SUPPLIES; also, New-York Agents for the Tuttle & Whittemore Co., Naugatuck Conn., Manufacturers of REFINED MALLEABLE IRON CASTINGS, from Patterns to order.

Special attention given to MALLEABLE IRON CASTINGS for Railroad Car construction.

VOSE, DINSMORE & CO.,

Manufacturers of

RAILWAY CAR SPRINGS

OF EVERY DESCRIPTION,

INCLUDING THE "COMBINATION ELLIPTIC SPRING."

Special attention is called to our Patent **CLIFF ELLIPTIC SPRINGS** for Freight and Passenger service. See advertisement, page ii.

Steel Rails, Locomotive and Car Tires, Elliptic Springs and Cast Steel of all descriptions.

JOHN C. WYMAN, General Manager.

194 Lake Street, Chicago.
720 North Second Street, St. Louis.

32 Warren St.,
NEW-YORK.

Railroad and House Painters' Colors,

Made from the Very Best Materials and especially prepared for Painting Railroad Cars, Station-Houses or Depots, Bridges, etc., etc.

BUYERS WILL FIND IT GREATLY TO THEIR ADVANTAGE TO EXAMINE OUR PAINTS WHEN PURCHASING.

Sample Cards furnished upon application.

Manufactured by BAXTER, BELL & CO., 21 Park Place and 18 Murray St.,

NEW-YORK,

Manufacturers and Importers of White Lead, Zinc Paints, Oils, Varnishes, Glass, Putty, Whiting etc., Fine and Ordinary Colors, Dry and in Oil.

HOADLEY & PERKINS
Manufacturing Co.

COR. FRANKLIN AND CENTRE STS.

(New-Haven Railroad Freight Depot),

MANUFACTURERS OF

BRASS COCKS

For Steam, Water, and Gas.

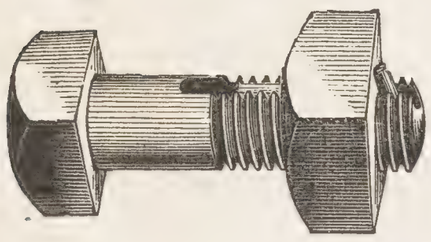
☞ *Illustrated Catalogue and Price-List furnished on application.*

Wm. Courtenay, President. Chas. F. Cobb, Secretary.

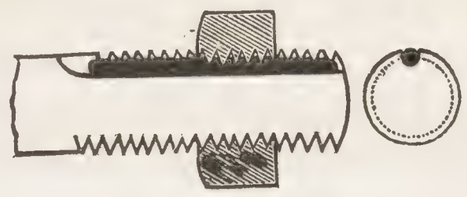
The Lock-Nut and Bolt Co., of New-York,

Office, No. 17 DEY STREET, New-York.

Manufacturers of all kinds of BOLTS, for FISH-PLATES, CARS, BRIDGES, MACHINERY, CARRIAGES, &c., with the



"Cumming Nut-lock,"
Patented
June 16, 1868,
August 23, 1870.



SECTIONS.

Unequaled for CHEAPNESS, SIMPLICITY & EFFECTIVENESS.

This simple device, as will be seen by the engravings, consists of a groove being cut in the threaded part of a screw bolt into which is placed a key of copper wire, or other soft metal; when the nut is screwed on, it cuts a thread on the key, thereby making it impossible for the key to get out until the nut is taken off. When the nut is screwed up to its place, that part of the key over which the nut has passed is riveted up against the nut with a small punch, destroying the thread on the key. The nut, therefore, can not move backward until force is used, as with a wrench.

The groove can be rapidly cut with a simple machine designed for the purpose.

Experience has proved this device absolutely reliable, and it is the cheapest of all known devices for the purpose. By its use, old bolts on which the nuts have become too slack for use can be made as good as new, making it a great saving to railroad companies and others in that item alone. It is cheaper than a check-nut.

If the bolt should become slack from shrinking of timber or other causes, *the nut will always remain firmly attached to the bolt*, and, with the wrench, can be screwed up *any distance*, and the wire riveted up any number of times, or can be taken off without injury to the nut or bolt.

This is the only method in use that locks the nut firmly to the bolt without regard to place or surroundings, all others require some attachment that holds the bolt in its position, and a washer or other attachment to keep the nut from turning.

Directions for Use.—Place the copper key in the slot, pointed end out, and beveled side up, in such a position that when the nut is screwed to its place about three-eighths of an inch of the key will project beyond its outer face. Then screw the nut to its place *over the key*, allowing it to cut its own thread in the copper. Then take a narrow flat set punch, and rivet the projecting part of the key *solidly* against the outer face of the nut. To tighten the nut: screw it up, and rivet the key tighter. To remove the nut: simply apply the wrench and unscrew the nut. It will cut its own way out through the copper. The same key can be used several times, by moving it outward a few threads in the slot.

DITTMAN'S

STAR NUT-LOCK.

Fig. 1

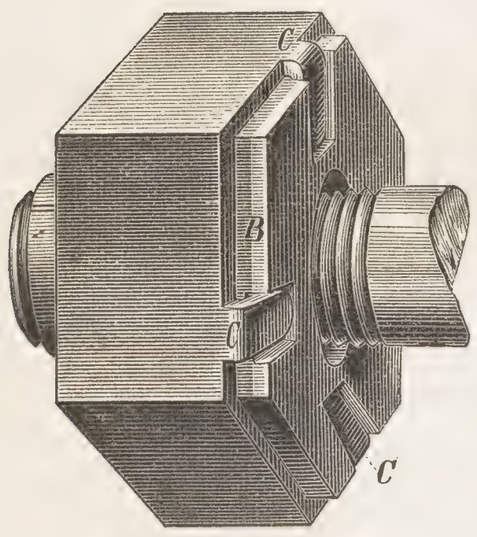
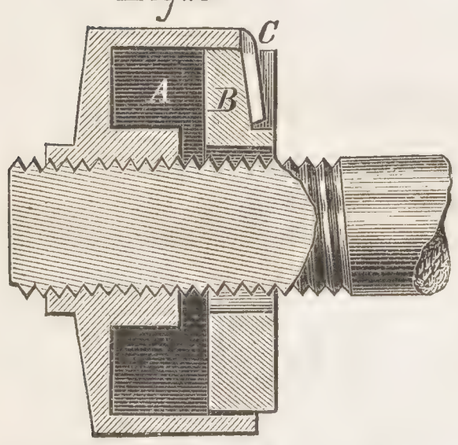


Fig. 2



Patented September 8, 1874.

The Nut-Lock herewith illustrated in perspective (Fig. 1) and section (Fig. 2) is so constructed as to prevent the backward rotation of the Nut under the influence of jars and jolts, and also to take up automatically the expansion or contraction of the bolt due to changes of temperature.

This Nut-Lock is not to be used in connection with Fish-Plates for a period of three years and five months, but for all other purposes it can be used. After that period has elapsed, it can be used with Fish-Plates.

We will guarantee the Nut-Lock not to be an infringement on any other invention. All parties infringing on our rights will be dealt with according to law.

License will be granted to manufacture the above Nut and samples furnished upon application to the

STAR NUT-LOCK CO.,

Leacock P. O., Lancaster Co., Pa.



HARRISBURG FOUNDRY

AND

Machine Company,

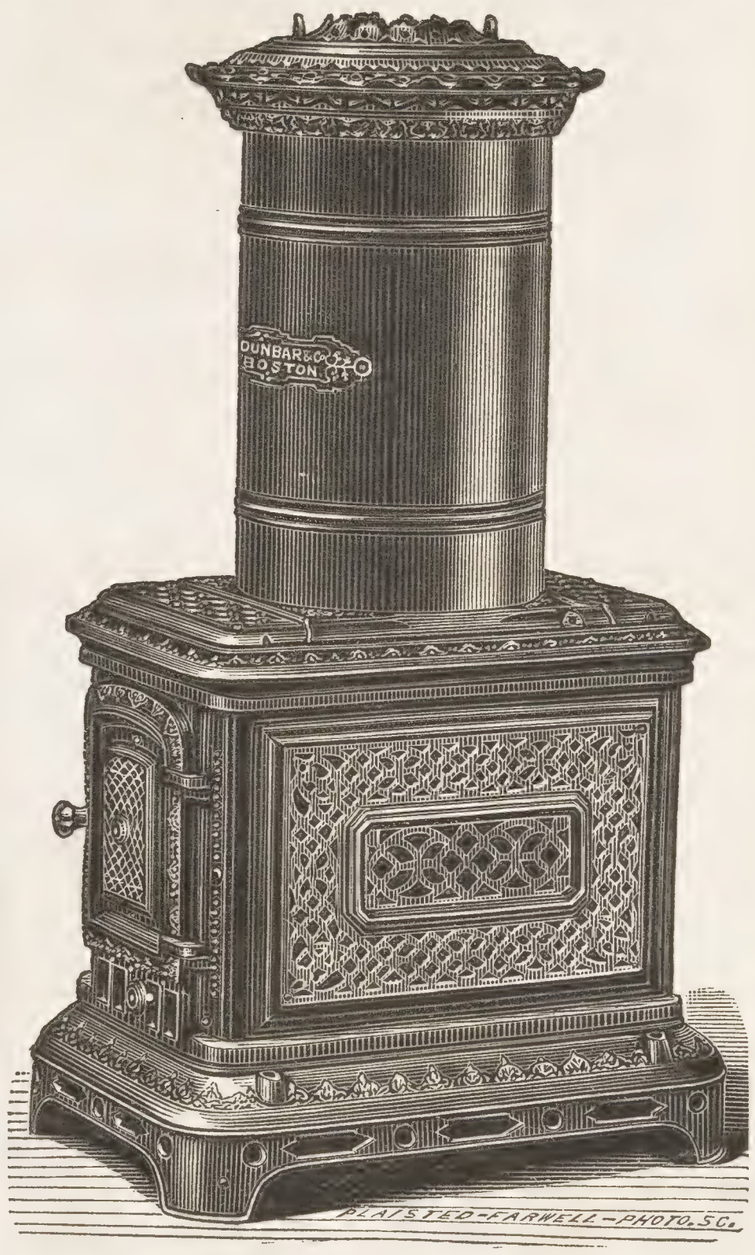
HARRISBURG, PA.

Manufacture all kinds of Machinists' and Car-Builders' Tools, for working Iron, such as Lathes, Planers, Slotting Machines, Horizontal Drilling and Boring Machines, Vertical Drills, all sizes, Shaping Machines, Bolt Cutters, Nut Tappers, Car Wheel Borers, Hydraulic Wheel Press, Axle Lathes, etc. Patent Sectional Tubular Boiler, safety and great economy at moderate cost.

Also Oil Tank Cars, Boiler and Sheet Iron work of all kinds, Foundry Cupolas, Cranes, Ladles, etc.

SAMUEL FISK, General Manager.

GEO. DUNBAR & CO.'S
Railway-Car Stove.



The above cut represents our new Railway Wood-Burning Car Stove, which for Style and Economy is unsurpassed by any in the market.

GEO. DUNBAR & CO.

Dealers in

General Railroad Supplies,

19 FEDERAL ST., BOSTON.

General Selling Agents for Boston Car-Spring Co. and Chrome Steel Co.

THE UNION WHITE LEAD MANUFACTURING COMPANY. PURE

Union White Lead Manufacturing Co.,

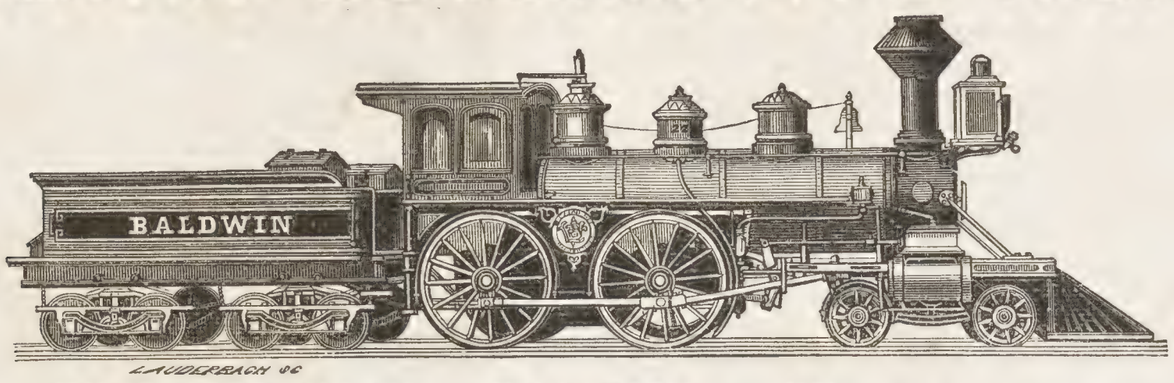
26 Burling Slip, New-York.

B. W. HOW, Secretary. JAMES HOW, President.

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BALDWIN LOCOMOTIVE WORKS.



BURNHAM, PARRY, WILLIAMS & CO., Philadelphia,

MANUFACTURERS OF

LOCOMOTIVE ENGINES,

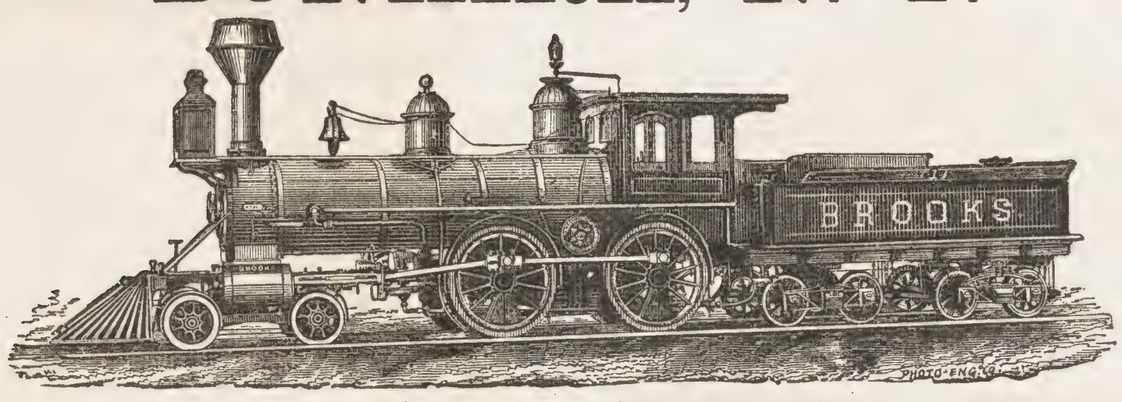
Especially adapted to every variety of Railroad use, including Mine Engines and Locomotives for Narrow-Gauge Railways.

☞ *All Work thoroughly interchangeable.* ☜

GEO. BURNHAM, CHAS. T. PARRY, EDWARD H. WILLIAMS, WM. P. HENSZEY, EDWARD LONGSTRETH, JOHN H. CONVERSE.

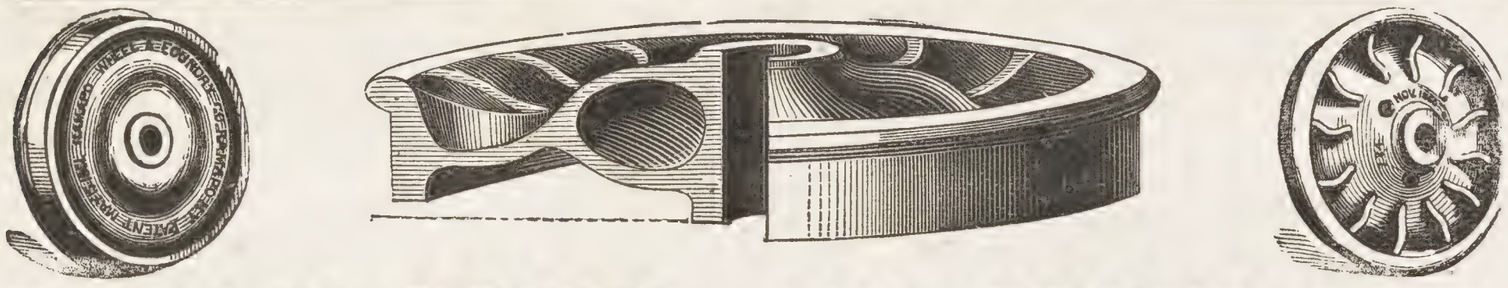
BROOKS LOCOMOTIVE WORKS,

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Orders solicited for Locomotives adapted to every class of Railway service.

M. L. HINMAN, Sec. and Treas. **H. G. BROOKS, Pres. and Supt.**



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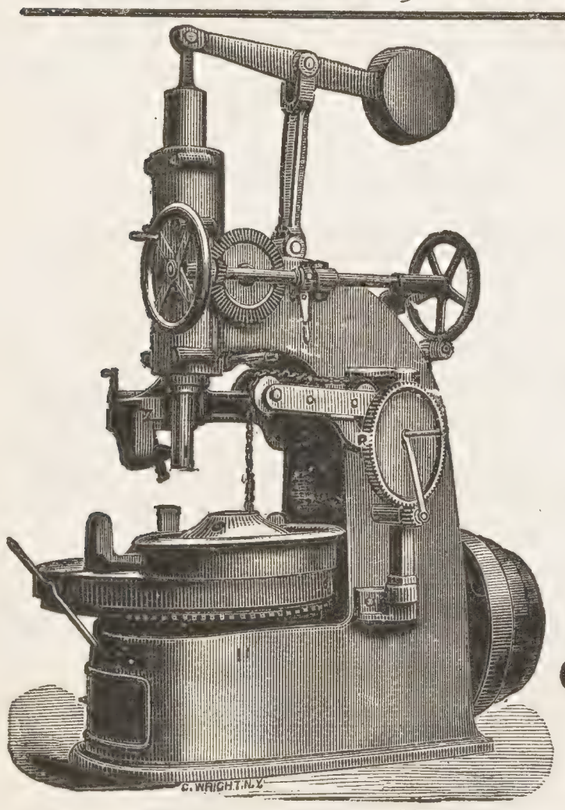
MANUFACTURERS OF

Chilled Wheels for Drawing-Room and Sleeping Coaches,

LOCOMOTIVES, TENDERS, PASSENGER AND FREIGHT CARS.

GEO. CHURCH, Pres't and Treasurer. **W. W. SNOW, Sup't and Gen'l Manager.**

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NEW-YORK STEAM ENGINE CO.
MANUFACTURERS OF
MACHINISTS' TOOLS
OF ALL DESCRIPTIONS
CHAS. A. CHEEVER, TREAS. GEO. Q. DOW, SEC'Y. No. 98 CHAMBERS ST. NEW-YORK

WE HAVE THE BEST AND MOST COMPLETE ASSORTMENT OF

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IN THE COUNTRY, COMPRISING ALL THOSE USED IN

MACHINE, LOCOMOTIVE, AND CAR SHOPS.

WE MAKE A SPECIALTY OF MANUFACTURING

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WHICH ARE MADE ABSOLUTELY PERFECT WITH OUR

PATENT MOULDING MACHINE.

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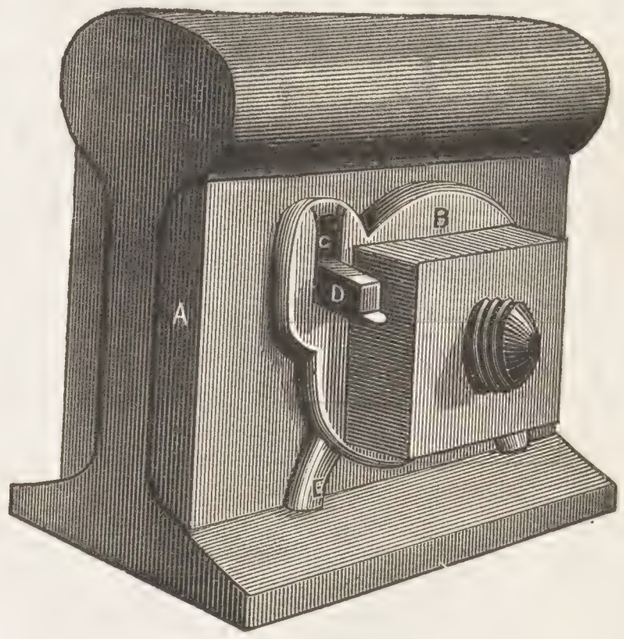
NEW-YORK STEAM ENGINE CO.,

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PURDIE'S PATENT

Safety Washer,

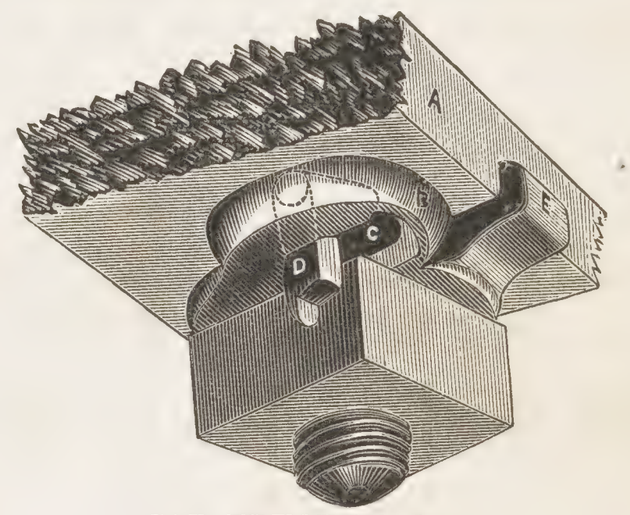
A Positive Nut-Lock, made of Malleable Iron.



For FISH PLATE.

EXPLANATION OF CUT.

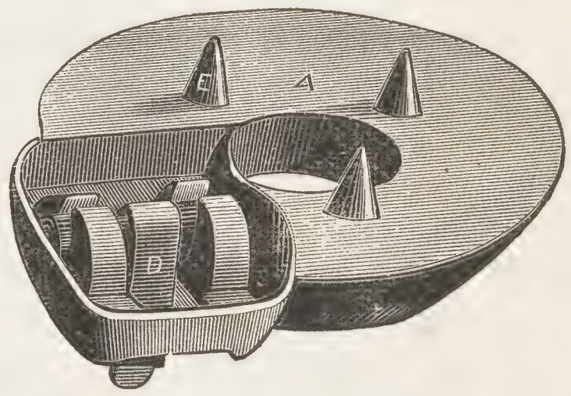
A, Fish plate. *B*, Washer, with projecting feet. *C*, Cavity, into which the dog, *D*, swings, on screwing up the nut. *D*, Pivoted dog which falls by side of nut when screwed home.



CAR TRUCK Washer.

Adapted for use on fish-plate bolts, car trucks, wagons, mowing machines, wood-work of all kinds, or for any purpose where bolts and nuts are used.

Cheap, Effective, and Durable.



Reverse side for WOOD-WORK, showing Method of Pivot Swing.

Will fit on old or new work, no alterations or special tools needed, requiring no rubber or wood for compressing or bending to hold the nut. The dog being in position to lock at any time required, by turning down by the side of the nut when screwed home; should the bolt or thread give any, so as to become loose, the dog will still hold the nut from turning back, and the nut can be screwed up as readily as by the old method.

Have been practically tested for two and a half years on many Railroads, giving unqualified satisfaction, one Railroad alone having them on over 2,500 cars.

Cast-iron washers for timber or bridges furnished to any size or weight.

Samples and price-lists forwarded on application to

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MANAGER OF

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No. 311 MAIN STREET,

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J. F. SULLIVAN,
DESIGNER AND ENGRAVER ON WOOD
No. 23 JOHN ST. NEW YORK

SOLID HEAD
NICKEL-PLATED SCREWS.
ADAMS NICKEL-PLATING and MFG. CO.
South Windham, Ct.

THE
PETERSBURG CAR COMPANY,
Petersburg, Va.,
Are now ready to receive orders for all kinds of
FREIGHT CARS.
These works are supplied with the most improved machinery, and have switch connections with broad and narrow gauge. They are prepared to furnish Rolling Stock with the utmost promptness, of the best materials and workmanship, and at the lowest prices.
JOHN W. FLEMING, Superintendent.
T. L. H. YOUNG, President.

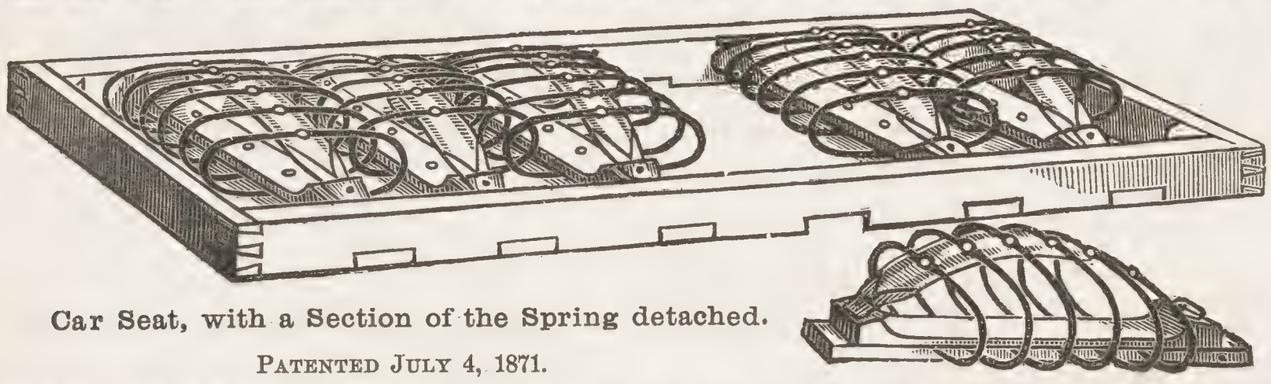
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Make a *Specialty of Freight Car Forgings* and *Castings* delivered to Shops. Also *Locomotive Cylinders, Frogs and Switches.* Address,
THOS. N. MILLER, President.

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UNIVERSAL WOOD WORKERS
TRADE MARK
WOOD WORKING MACHINERY.
BENTEL, MARGEDANT & CO.
HAMILTON, OHIO.
Send for Catalogue and Price List.

CRANK PLANERS.
Superior Design and Workmanship, Extra Heavy (1400 lb.)
DOWN, ANGULAR & CROSS-FEED,
TO PLANE 12x16x15.
The Hull & Belden Company, Danbury, Ct.

IRON AND STEEL
DROP FORGING.
Of Every Description, at Reasonable Prices.
The Hull & Belden Company, Danbury, Ct.

COBB'S ELLIPTIC STEEL SPRING.



Car Seat, with a Section of the Spring detached.

PATENTED JULY 4, 1871.

FOR CAR SEATS AND SPRING MATTRESSES FOR SLEEPING CARS.

These Springs have been in successful operation on a large number of the leading railroads in the United States for over three years.

OFFICE OF PULLMAN PALACE CAR COMPANY,
CHICAGO, January 1, 1873.

Z. COBB & SONS, CHICAGO, ILL.:
GENTS: Have used your Patent Elliptic Steel Spring *exclusively* for the last three years in over **300** of our cars, and are satisfied of their superiority over all other springs in use.
A. B. PULLMAN.

Z. COBB & SONS, 292 West Adams Street, CHICAGO.
BRANCH OFFICE: Wilmington, Del.

NEW-HAVEN
CAR HEAD-LINING WORKS,
NEW-HAVEN, CONN.

In consequence of the large and increased demand for our "CAR HEAD LININGS" we have been obliged to remove our Manufactory from WORCESTER, MASS., to NEW-HAVEN CONN., where new and commodious buildings have been erected, with increased conveniences for promptly supplying our customers, and we beg to invite your attention to our new and SUPERIOR FACILITIES for furnishing

"CAR HEAD LININGS"

OF THE MOST APPROVED STYLES AND PATTERNS

Either Full Decorated, Part Decorated, Encaustic, or Printed and Plain,

At Short Notice and in the Most Satisfactory Manner.
Orders will be received at the Factory, in New-Haven, Ct., or by

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No. 8 Dey Street, New-York,

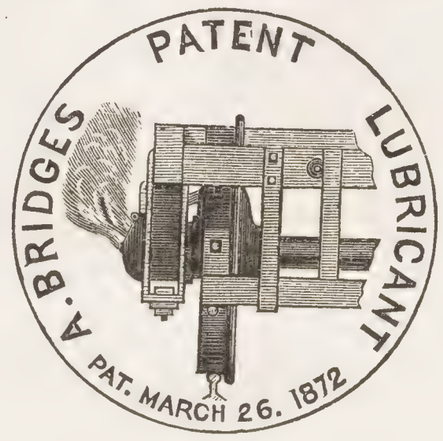
MANUFACTURERS AND DEALERS IN RAILWAY AND TELEGRAPH SUPPLIES OF EVERY DESCRIPTION.

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MANUFACTURER OF
Railroad Car Head Linings,
15 Hamilton Street,
ALBANY, N. Y.

Particular attention paid to Drawing-Room and Sleeping Car Linings.

Refers to Hon. W. WAGNER, Esq., Pres't of Sleeping Car Co.

HOT JOURNALS ENTIRELY PREVENTED
BY THE USE OF



For Railroad Car Journals and other Bearings.

In presenting this Lubricant to the notice of Railroad and Steamboat Managers and Operators in Machinery generally, I do so with a practical knowledge of its merits, and with confidence that it will be found to possess invaluable qualities as a

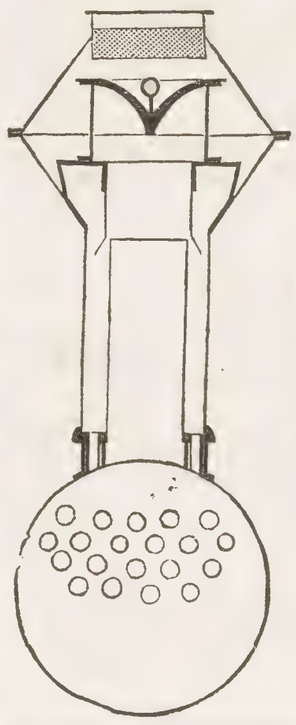
Lubricator and Counteractor of Friction.

It has been in use, during the past two years, on a number of Railroads and Steamers, and is highly approved of.
Parties wishing to make a practical test of the Lubricant will be furnished with sample on application.

ALBERT BRIDGES, Patentee,
MANUFACTURER AND DEALER IN
RAILWAY SUPPLIES and MACHINERY,
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SEND FOR CIRCULAR. NEW-YORK.

HERRICK'S CAR WORKS,
OSWEGO, N. Y.,
Are in full operation and stocked with selected material for manufacturing
Box, Platform and Coal Cars
Prices and terms to suit the times. Orders solicited. Address,
WM. H. HERRICK, Proprietor.

ANTHONY ROSS & JAMES McINTOSH'S
SPARK-CONSUMING SMOKE-STACK,
For Coal and Wood Burning Locomotives.



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We are now prepared to lay before the Railroad public a Smoke-Stack, which has been used for twelve months on the Memphis and Charleston Railroad, on Passenger, Freight, and Switching Engines, carrying the most combustible article—Cotton—without any danger of Fire whatever from sparks, or annoyance to passengers.
Railroad Companies wishing to use them can be furnished with working drawings by sending size of cylinder of engines to be used upon.
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Steel Stamps, Steel Letters, and Figures,
Of every description, and for all purposes.
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ENGRAVER,
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For Blacksmiths, Coach-Makers, Machinists, Contractors, and all having use for Smith or Forge fires. Suited to any fire, right or left side; works easy, blast regular, and made at will for light or heavy work; only occupies 12×20 inches floor space; cheaper and better than bellows.
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Circular and Price free. Address
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THE ROCKY MOUNTAIN VERMILION PAINT

Is "Nature's Compound" of COPPER, MERCURY, LEAD, and IRON.

A PURE OXIDE OF METALS, CONTAINING NO EARTHY MATTER.

Hence we claim and are prepared to *prove* that it is the

Best and Cheapest Paint in the Market.

Properly mixed, we will guarantee it to Cover Double the Surface and wear twice as long as ordinary paints. It will not *Peel*, *Scale*, *Crack*, or BLISTER, though subjected to high degrees of heat. It will effectually prevent the corrosion of metals even in mid-ocean. Warranted *superior* to Red Lead, or any other lead, for any and all purposes for which Paint is required. We are fully aware that these statements will be more or less discredited by many, and although we might produce hundreds of testimonials corroborating our claims, even then doubts would exist; and as the most convincing proofs are obtained by actual test, we simply ask you to *TRY IT!* Submit it to any reasonable test you please, and you will soon find that we have not *overstated the facts*, and that *your interest*, and the interests of *all concerned*, will be subserved by the use of the

ROCKY MOUNTAIN VERMILION PAINT.

ROCKY MOUNTAIN VERMILION PAINT CO. Trade Mark.

Furnished dry, in whole and half barrels containing 200 pounds and upward; also ground in pure linseed oil, in barrels or kegs; also in gallon packages, mixed ready for use.

ALL ORDERS SHOULD BE ADDRESSED TO

WILLIAM H. COREY,

General Agent for the United States and Territories,

No. 20 SABIN STREET, PROVIDENCE, R. I.

CAUTION.

Owing to the great superiority of this Paint over all others, causing a constantly increasing demand, some unscrupulous parties are selling inferior articles of paint under the name of

ROCKY MOUNTAIN.

Be sure that each package bears the Trade-Mark of this Company, as herein shown, without which none is genuine.

LEHICTON PAINT AND LINSEED-OIL MILLS,

C. E. HECHT, Proprietor,

EASTON, PA.

Pure Raw and Boiled Linseed Oil, White Leads and Zincs, Colors, Putty, Varnishes, Japans, etc.

SOLE MANUFACTURERS OF THE

CAR COLORS,

so long used and so highly recommended as the cheapest and best covering for all outside work ever offered. The CAR COLORS are all ground in Pure Boiled Linseed Oil, and packed in all sized kegs and barrels.

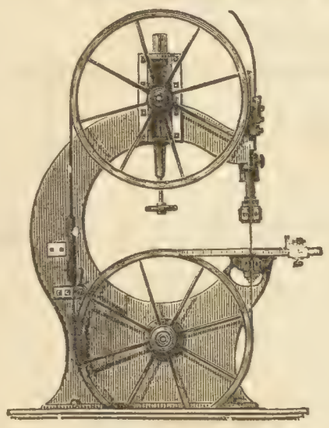
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Wood Cutting Machinery

FOR

Railway-Car Building, Ship-Building, and Band Sawing.



The Celebrated French "**M. PERIN & CO.**" Band Saw Blade,

ANY LENGTH AND WIDTH.

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ATLANTIC WORKS,

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ROOFS.

IMPROVED PLASTIC SLATE.

Will repair and preserve old Roofs of Shingles, Tin, Cement, or of any kind, CHEAPER and more substantially than any thing else in use. It has been tested and improved upon for TEN YEARS, and is a perfect protection against *Weather* and *Fire*, and is INDORSED by EIGHTY-TWO FIRE INSURANCE COMPANIES. Reference is made to over **2000** *Roofs* in New-York, on CHURCHES, BROWN STONE DWELLINGS, FACTORIES, etc. It is equally good for *Steep* or *Flat* Roofs, and is easily applied on old or new buildings.

PRICES OF MATERIALS READY FOR USE.

PLASTIC SLATE PAINT, 60 CENTS PER GALLON. 1 gallon will cover nearly 200 square feet.

Plastic Slate Roof Coating, THICK, 60 cents per gallon. 1 gallon will coat about 100 square feet.

Plastic Slate Cement, for pointing up Chimneys, etc., 10 cents per pound.

One, Two and Three-ply Roofing Felt and Building Paper, 1, 2 and 3 cents per square foot.

Materials put up for shipment to any point, with simple instructions for use.

General Merchants should sell these Improved Plastic Slate Roofing Materials, as they can recommend them with entire confidence.

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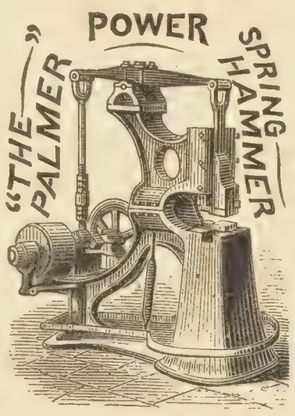
(Established 1863,) Sole Manufacturers, **79 Maiden Lane, N. Y.**

THIS HAMMER

Awarded the First Premium of a Silver Medal

AT THE

American Institute Fair, N. Y. City, Nov., 1873.



Superior in every point to any modification of the Trip Hammer.

Simple, Powerful,

Efficient and Cheap.

Four Sizes now being Built.

For Prices and Descriptive Circulars, address the Manufacturers,

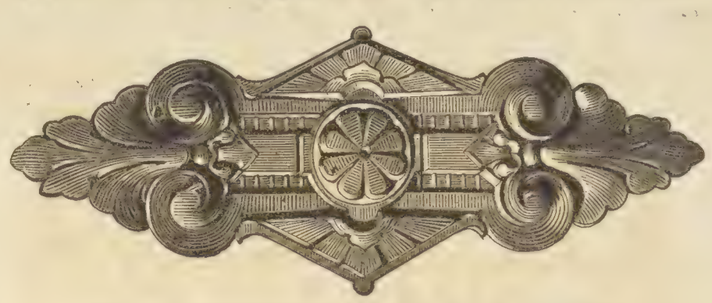
S. C. FORSAITH & CO.,

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Who are also Builders of the

Abbe Bolt-Heading Machine.

Artificial Wood Ornaments.



We invite the attention of the trade, including

Furniture Manufacturers, Builders, Interior Decorators, Stair-Builders, CAR BUILDERS, Architects, Steamboat Builders, Organ Manufacturers, and others,

To our variety of styles of ornaments, made to match black walnut in color, and which are perfectly fitted for use where not exposed to the weather. They have been sold extensively for several years, and have given entire satisfaction—so that all who have once used them have become constant consumers. They are artistic in design and unequaled in execution, being the production of the best artists, carvers, die sinkers, and moulders.

These ornaments hold glue and screws as well as carvings. They do not warp or crack. They are unaffected by changes of temperature, and withstand dampness as well as furniture. They will polish in every respect equal to wood, either with shellac, oil, wax, or varnish, and with less trouble, as there is no open grain to fill. They will gild or bronze beautifully by simply sizing, without any other preparation.

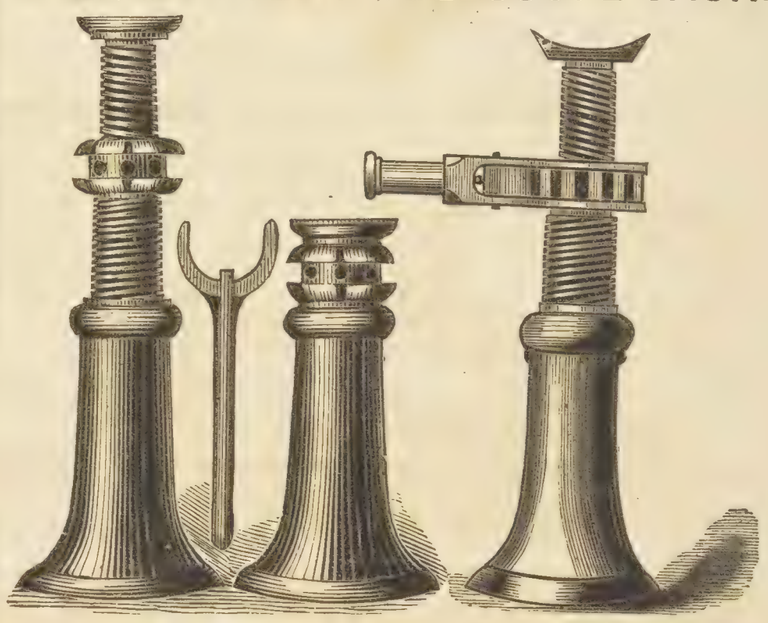
Our goods can be purchased of the Hardware houses in the various cities of the Union. Circulars mailed on application to

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BALL'S PATENT TELESCOPE JACK.



Hot and Cold Punched Nuts, Bolts, Lag Screws and Washers. Belting, Packing Hose, Rubber Springs, Car Trimmings, Steam Pumps.

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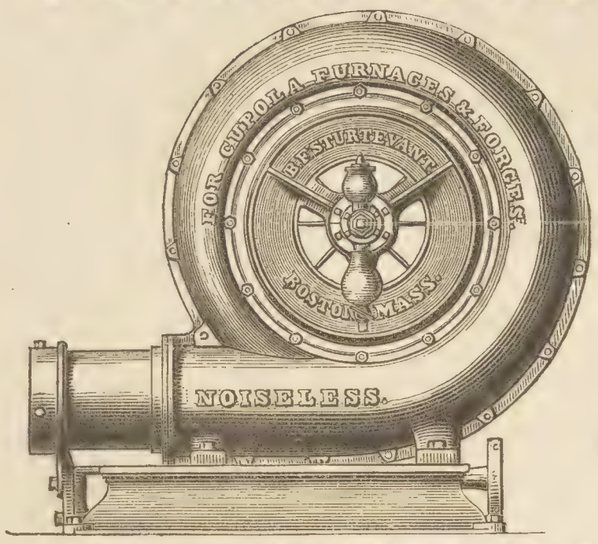
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PATENT STEEL PRESSURE BLOWER



For Cupola Furnaces and Forges.

The Blower which excels all others, **producing *maximum* results with *minimum* power. Used in the largest establishments in the country, where the strongest blast is required.**

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For Steam Boilers, Puddling and Heating Furnaces.

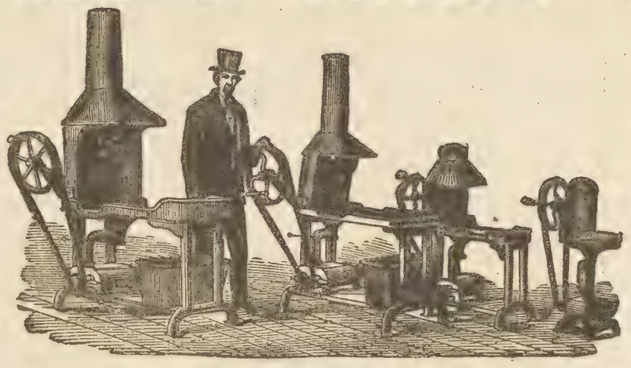
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For removing Shavings and Dust from Wood Working Machines, Dust from Sand and Emery Wheels, &c., and for Ventilation.

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ROOTS' PATENT PORTABLE FORGE.



ADAPTED TO EVERY VARIETY OF WORK.

THE ONLY FORGE WITH FORCE BLAST BLOWER.

THE ONLY EFFECTIVE FORGE MADE.

P. H. & F. M. ROOTS, Manuf'rs, CONNERSVILLE, IND.
S. S. TOWNSEND, 31 Liberty Street, NEW YORK.

WINSLOW IRON CAR ROOF.

See Advertisement, Page vii.

MAHOGANY,

Walnut, Satin-Wood, Rosewood, Hungarian Ash, Amboine, Thuya, and all kinds of Hard and Fine Woods, in Logs,

Plank, Boards, and Veneers.

WE INVITE THE SPECIAL ATTENTION OF

CAR BUILDERS.

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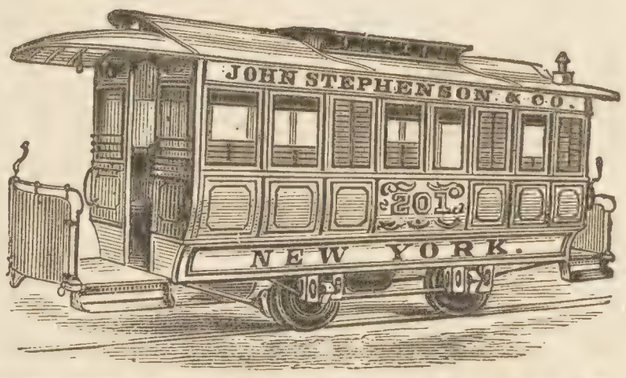
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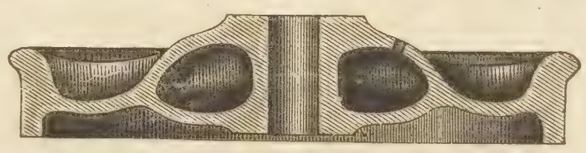


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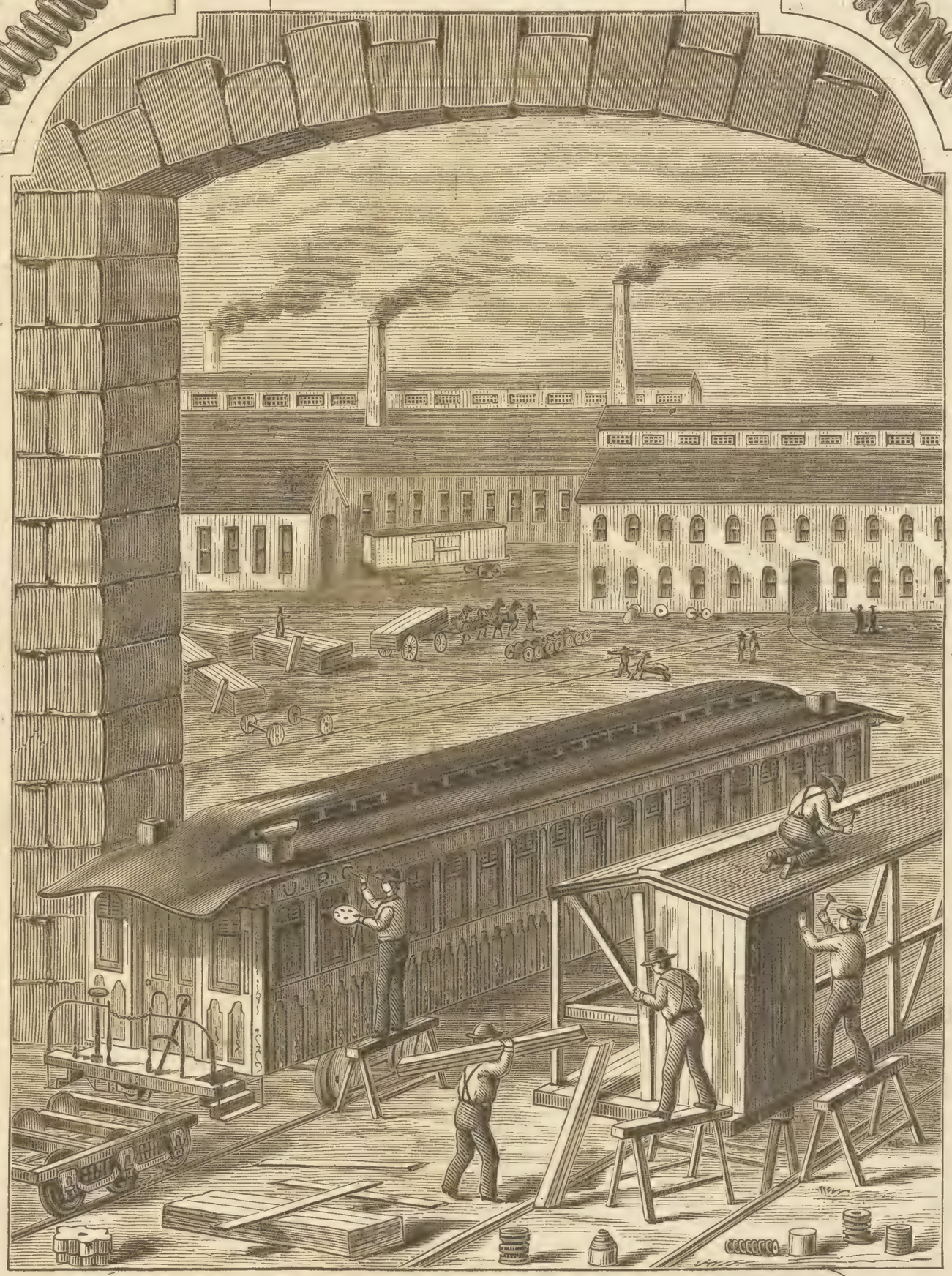
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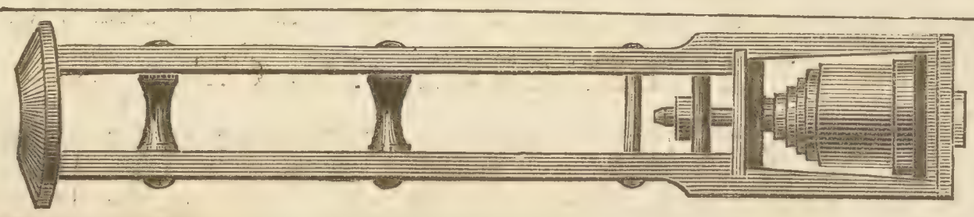
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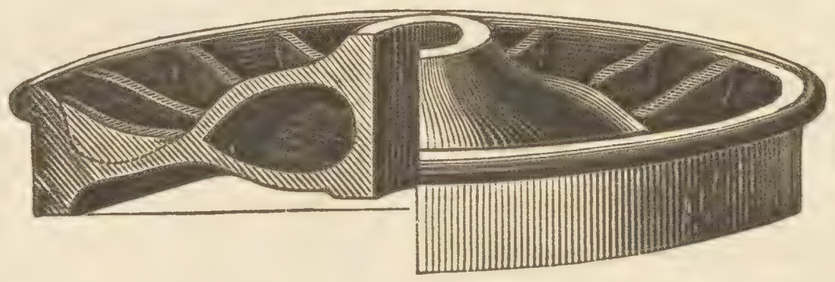
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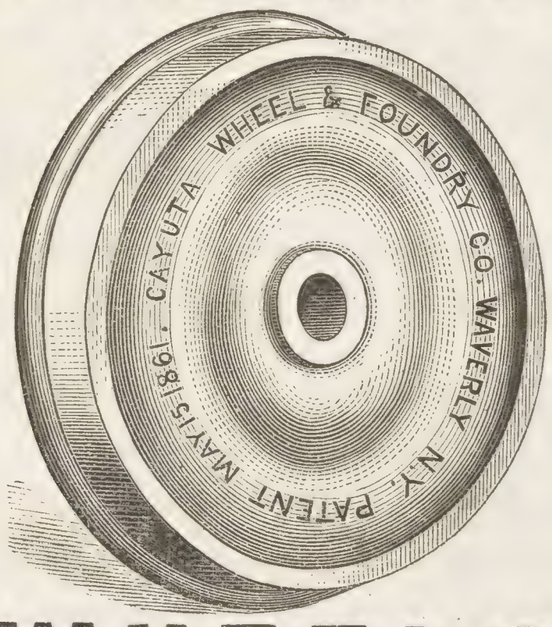
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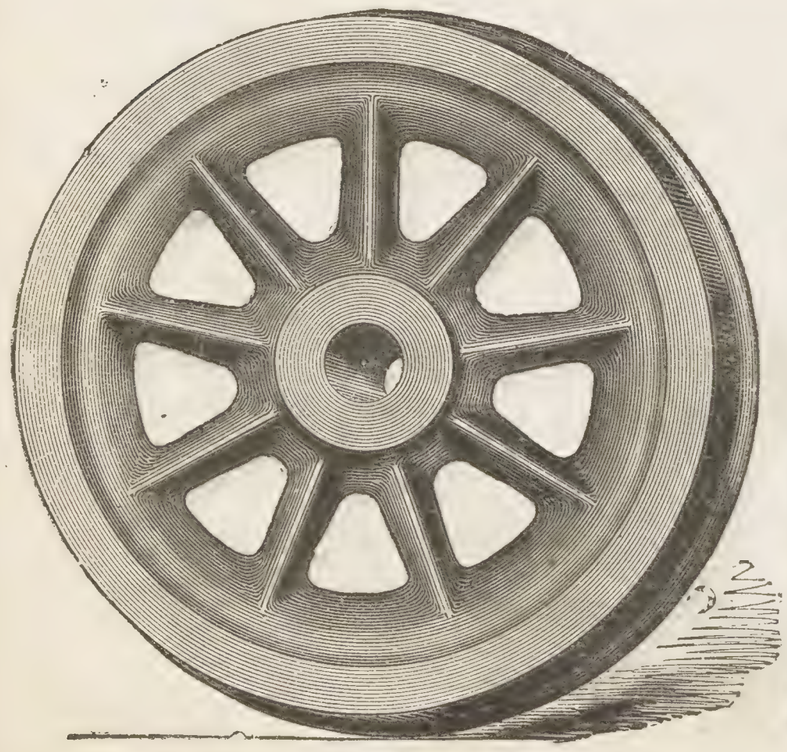
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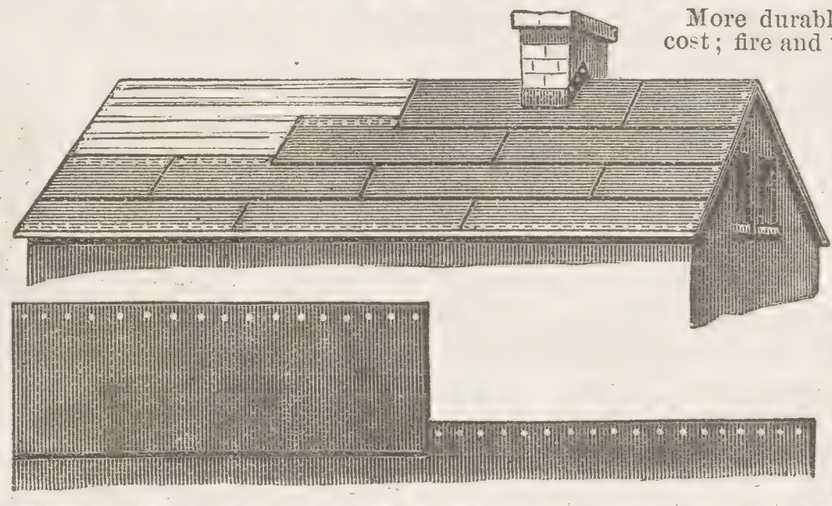
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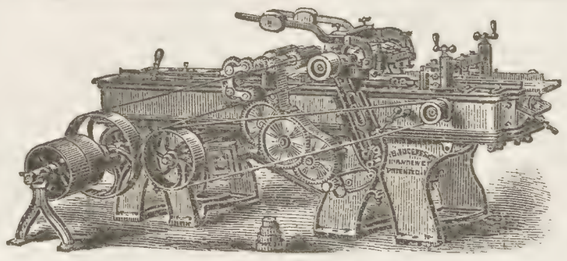
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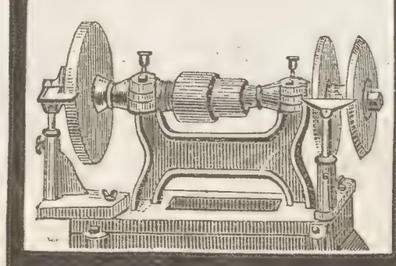
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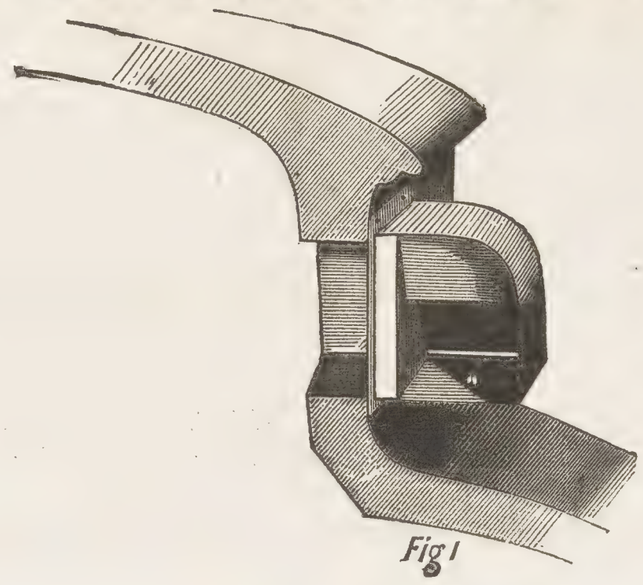
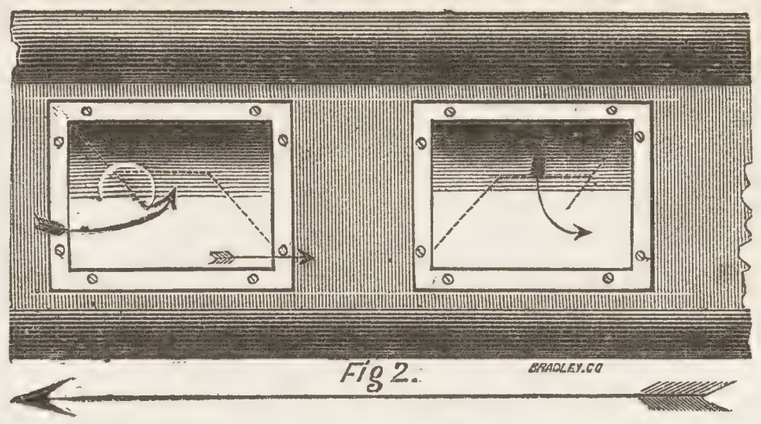


Fig 1



THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place. it is always in readiness, and runs itself independent of all employees.

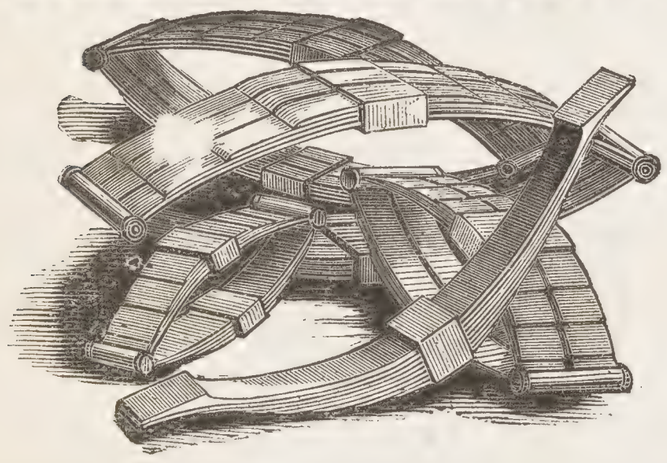
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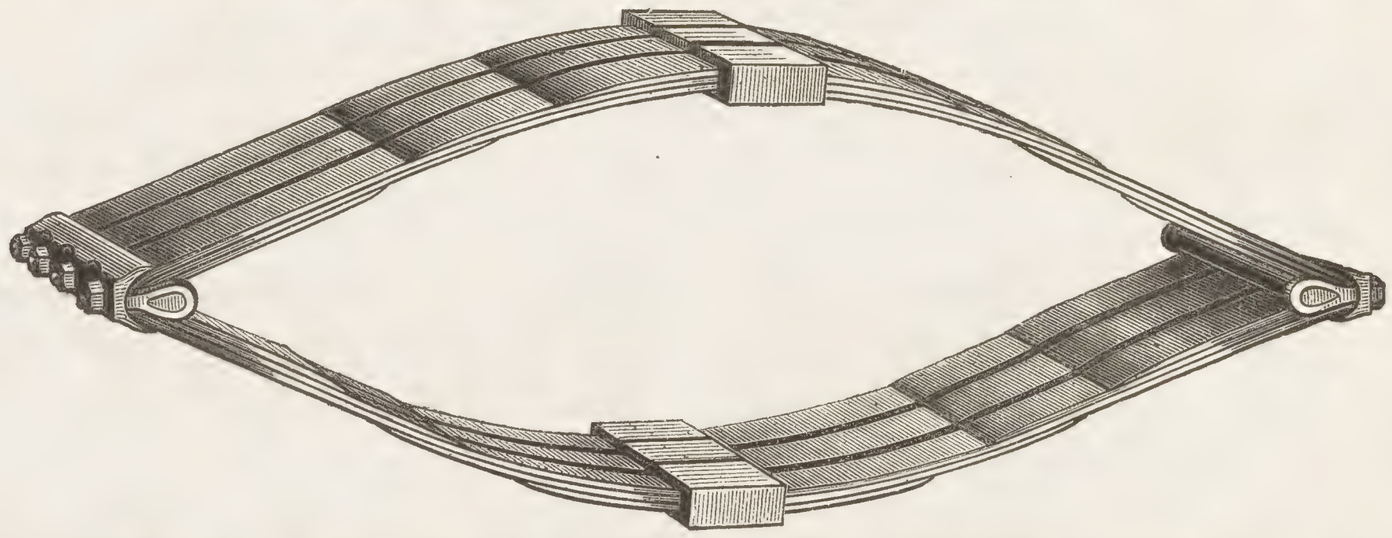
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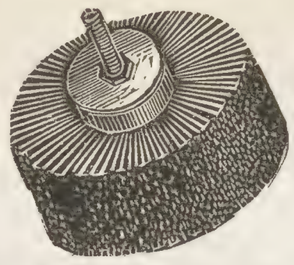


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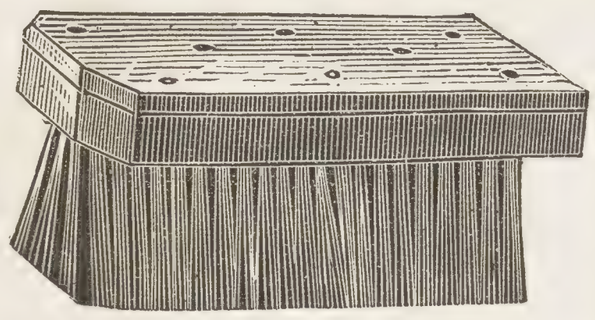
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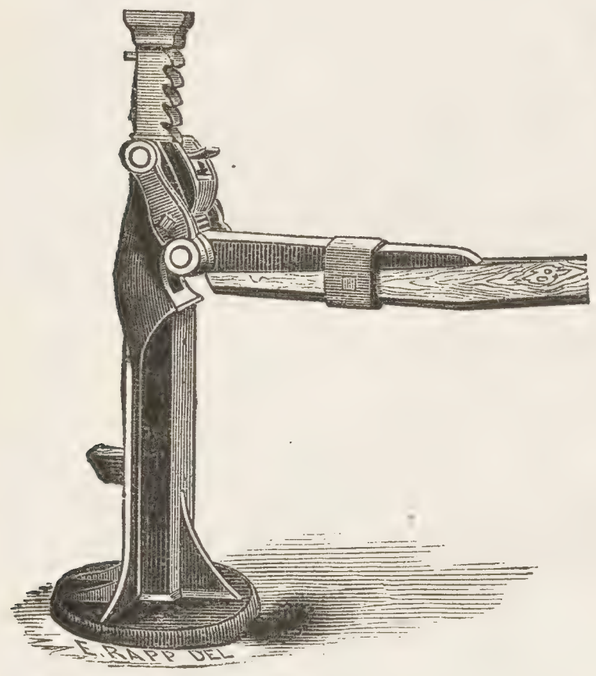
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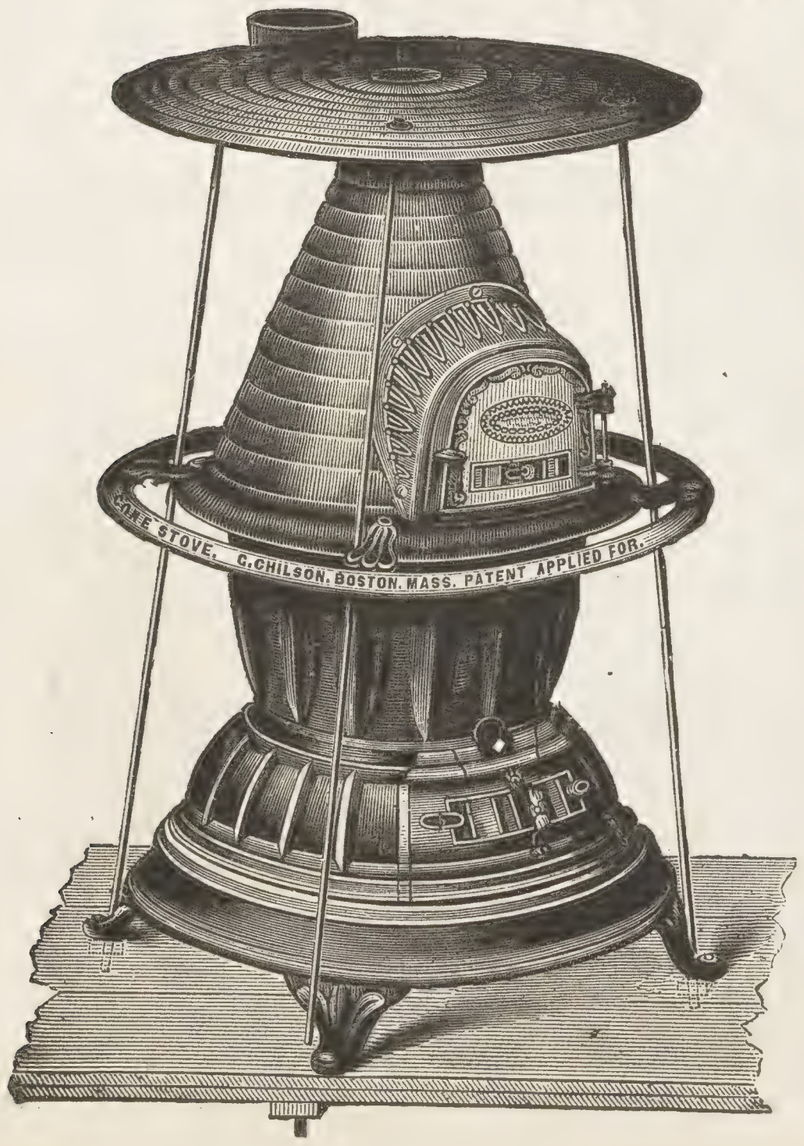


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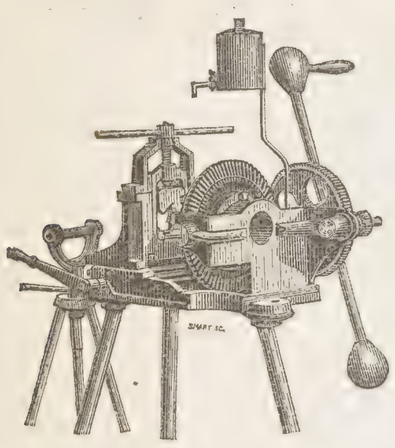
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This important tool is designed to fill a want long felt by STEAM AND GAS FITTERS AND MACHINISTS for cutting and threading pipes rapidly and cheaply. An Apprentice Boy, with one of these, can do more work than Two Men with old appliances under our old system. No PIPE SPLITTING! No BEVEL INSIDE OR OUT! It cuts threads and makes nipples for all sizes of pipes, from ⅛ to 2 inches. Stronger than any machine made. A full set of collars for making nipples goes with the machine.

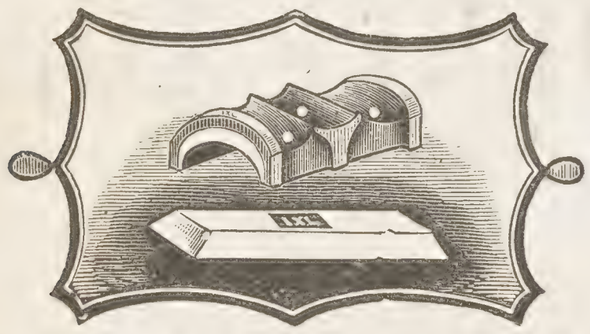
Address.

The Chase Manufacturing Co.,
120 Front St., New-York.

Send for Circular.

For sale by MORRIS, TASKER & CO., Philadelphia, New-York, and Boston; and W. H. BANKS & CO., 34 and 36 South Canal Street, Chicago.

ORGANIZED MAY 1869.



I X L METAL COMPANY

OFFICE AND FOUNDRY,

No. 7 North Third Street, ST. LOUIS, MO.

Sole Proprietors and Manufacturers of the

I X L ANTI-FRICTION METAL

AND JOURNAL BEARINGS,

Railroad Companies will find a great saving in their expenses, and very little trouble from hot boxes, by using these bearings. A sample set for a trial sent free of charge, by sending a Brass for pattern. Mills, Steamboat Companies or others, will find this a superior Composition for Bearings.

EMPIRE PORTABLE FORGES

NO BELTS, BELLOWS OR CRANKS;
THE BEST MADE.
Send for Catalogue to the
Empire Portable Forge Co. Troy, N.Y.
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"DEAD STROKE" POWER HAMMER.

IMPROVED ADJUSTABLE CRANK PIN.
STRIKES BLOW HEAVY OR LIGHT, FAST OR SLOW.
Prices Reduced Jan. 1st, 1875.
The Hull & Belden Company, Danbury, Ct.

IRON CLAD PAINT.



Address IRON CLAD PAINT COMPANY,

CLEVELAND, OHIO.

This Company owns and manufactures under WM. GREEN'S several patents, and is the only Company in the world that makes Paint from pure hard Lake Superior Iron Ore, such as is used in furnaces for making Pig Iron.

The most Economical, Most Fireproof, Most Waterproof, Most Durable, and Most Useful Paint made.

Used by L. S. & M. S. RY.	I. & ST. L. R. R.
D. & M. RY. O. & M. RY.	C. C. C. & I. RY.
The K. P. R. R. CO.	L C. & L. R. R.
T. W. & W. RY.	L. S. & T. V. R. R.

Etc., etc.

OFFICE OF PURCHASING AGENT
LAKE SHORE AND MICH. SOUTHERN RAILWAY,
CLEVELAND, O., Sept. 12, 1873.

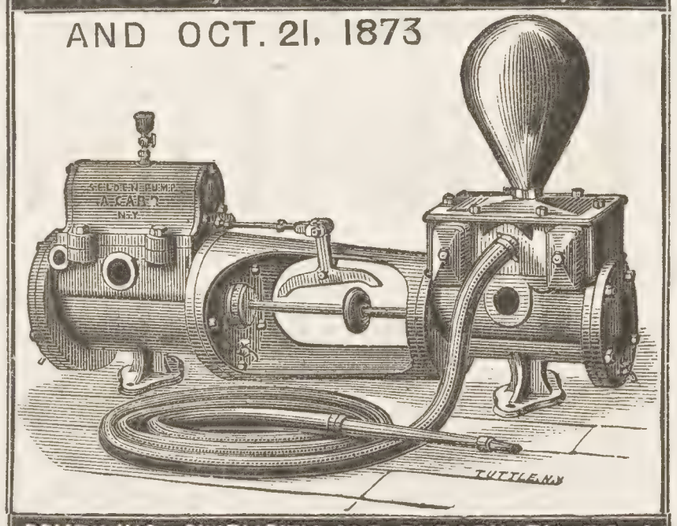
IRON CLAD PAINT COMPANY, CLEVELAND, OHIO:

GENTLEMEN: Your "Metallic Paints" known as "*Iron Clad Paints*" have, in the past six years, been extensively used and thoroughly tested by this Company, as to their *covering capacity, durability, and resistance to atmospheric changes*—latter "paint destroyer"—the most difficult to overcome in outside paints. We can emphatically accord them the highest position over any paint heretofore produced, for Cars, Roofs, Stations, Bridges, etc. The monthly increase of our orders is the best evidence that the Paint is constantly growing in favor with our mechanics.

Very respectfully yours,
A. C. ARMSTRONG,
Gen'l Purchasing Agent L. S. & M. S. R. R.

THE SELDEN DIRECT-ACTING STEAM-PUMP

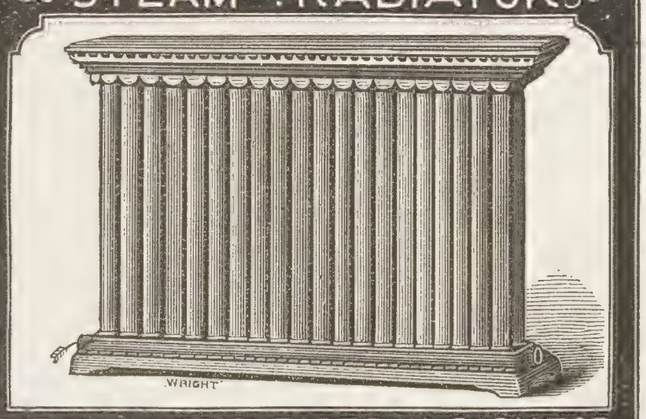
PAT. AUG. 2, 1870. DECEMBER 20, 1870
AND OCT. 21, 1873



COMBINING SIMPLICITY AND DURABILITY TO A REMARKABLE DEGREE. IT'S PARTS ARE EASY OF ACCESS AND IT IS ADAPTED TO ALL PURPOSES FOR WHICH STEAM PUMPS ARE USED

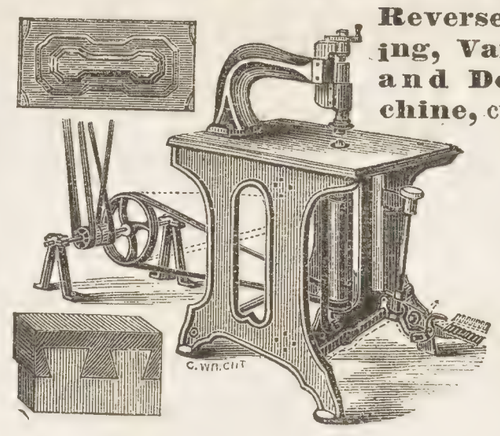
A. CARR

MANUFACTURER AND PROPRIETOR,
43 CORTLANDT ST. NEW YORK.
CARR'S POSITIVE CIRCULATING
STEAM RADIATOR



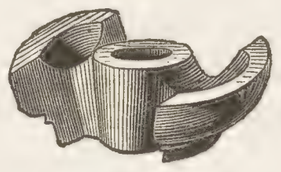
THE ONLY UPRIGHT STEAM RADIATOR MADE WHICH HAS A POSITIVE CIRCULATION.
ALSO
WROUGHT IRON PIPE, BRASS AND CAST WORK &c.,
FOR
PLUMBERS, STEAM AND GAS FITTERS.
SEND FOR DESCRIPTIVE CIRCULAR & PRICE LISTS

BOULT'S PATENT



Reverse Motion, Paneling, Variety Moulding and Dovetailing Machine, cuts Panels of any design or style of Mould in the solid wood, with neatness and dispatch. Is a first-class Shaper, Edge and Scroll Moulder. Does general Dovetailing with thick or thin stuff.

Simple, Durable, and Efficient.



☞ Send for Pamphlet and sample of work.

Improved Solid Steel Cutters for all kinds of Variety Moulders made to order, and warranted by the

B. C. MACHINERY CO.,

Battle Creek, Mich.

WALL'S MAGIC RENOVATOR.

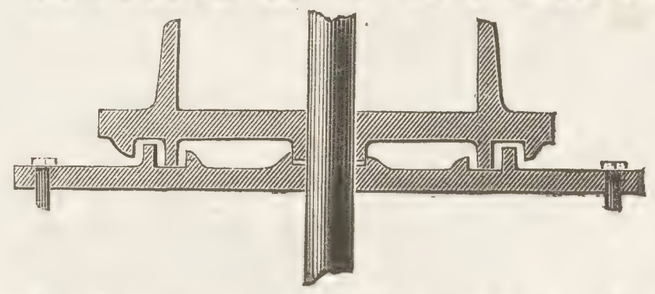
For Cleaning and Polishing Gold, Silver, Nickel, Brass, Copper, and Lacquer Gilt on Metals. A chemical liquid free from acids, which will remove all tarnish, dirt, and grease, from whatever cause, almost instantaneously, and without injury to the metal.

Price, per gallon, $5; in pint bottles, $1; ½ pint, 50 cents. Discount of five per cent on orders for ten gallons. A liberal commission to Agents.

Samples sent on application to

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WARD'S PATENT



CENTER OR TRANSOM PLATE

FOR RAILWAY CARS,

With Oil Receptacle for Bearing-Ring to work in. They are acknowledged to be the best in use. See description and drawings in CAR-BUILDER for January, 1874.

Address, AMBROSE WARD,
ALTOONA, PA.

ST. CHARLES CAR CO.

This Company is now prepared to furnish on short notice, and at low prices, all kinds of

FREIGHT CARS,

built in the most approved manner and of the best material. Orders respectfully solicited. Address,

ST. CHARLES MFG. CO.,
ST. CHARLES, MO.

REFERENCES.

THOS. ALLEN, Pres't St. Louis, Iron Mountain & Southern R.R.
T. MCKISSOCK, Gen'l Sup't St. Louis, Iron Mountain & S. R.R.
A. W. LOPER, Ass't Sup't St. Louis, Iron Mountain & S. R.R.
WM. HOGE, Pres't St. Louis, Kansas City & Northern R.R.
W. C. VAN HORN, Gen'l Sup't St. Louis, Kansas City & N. R.R.
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Trade Mark, Registered May, 1874.

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CRESCENT BRAND MOSS,

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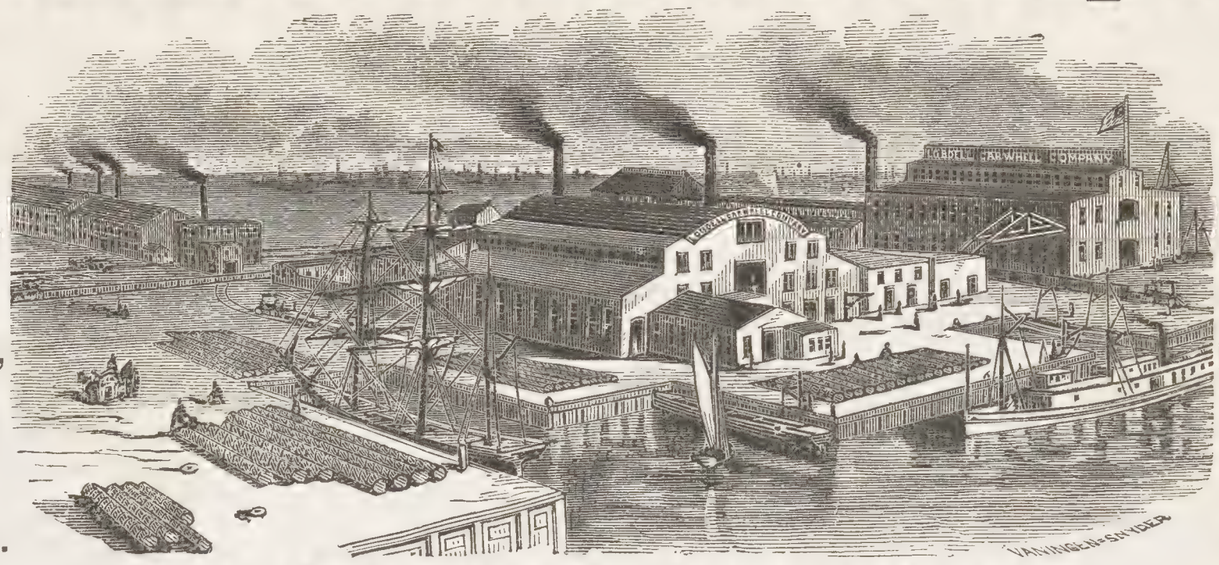
FACTORY—162 FRONT and 160, 162 and 164 DELTA ST., N. O.

OFFICE—57 MAGAZINE STREET.

Having perfected and patented our machinery, we guarantee all Moss put up by us to possess the following qualities—*full length of fibre, freedom from dust, strictness of grade, preservation of elasticity, and exactness of weight*, and used with great success by the leading carriage makers, upholsterers and railroad companies in the United States, as the most economical substitute for curled hair.

Lobdell Car-Wheel Company.

SINGLE AND DOUBLE PLATE AND HOLLOW SPOKE WHEELS, FOR City and STEAM ROADS.



CHILLED ROLLS FOR PAPER, BRASS, COPPER, AND ROLLING MILLS. Castings of all Descriptions.

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GEO. G. LOBDELL, PRES'T. W. W. LOBDELL, SEC'Y. P. N. BRENNAN, TREAS.

Stimson & Babcock,

VARNISH MAKERS,

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RAILWAY CAR VARNISH.

Elastic, pale, and extremely durable, possessing great brilliancy of lustre, and producing a hard, fine **finish,** resisting in the highest degree effects of time and exposure. Should be used over our Rubbing.

RAILWAY RUBBING VARNISH.

Hard-drying, works freely on large panels, will not sweat out, and is very desirable where a fine and durable surface is requisite on which to finish.

LOCOMOTIVE VARNISH.

Dries readily, with brilliant lustre; durable under severest exposure in any climate.

INSIDE CAR VARNISH.

A hard-drying Varnish for inside work; is very light-colored, flows well, and dries in about 12 hours.

JAPAN GOLD SIZE.

Very pale, and preferable to Japan as a drier for delicate colors.

COACH PAINTERS' JAPAN.

A Superior Drier.

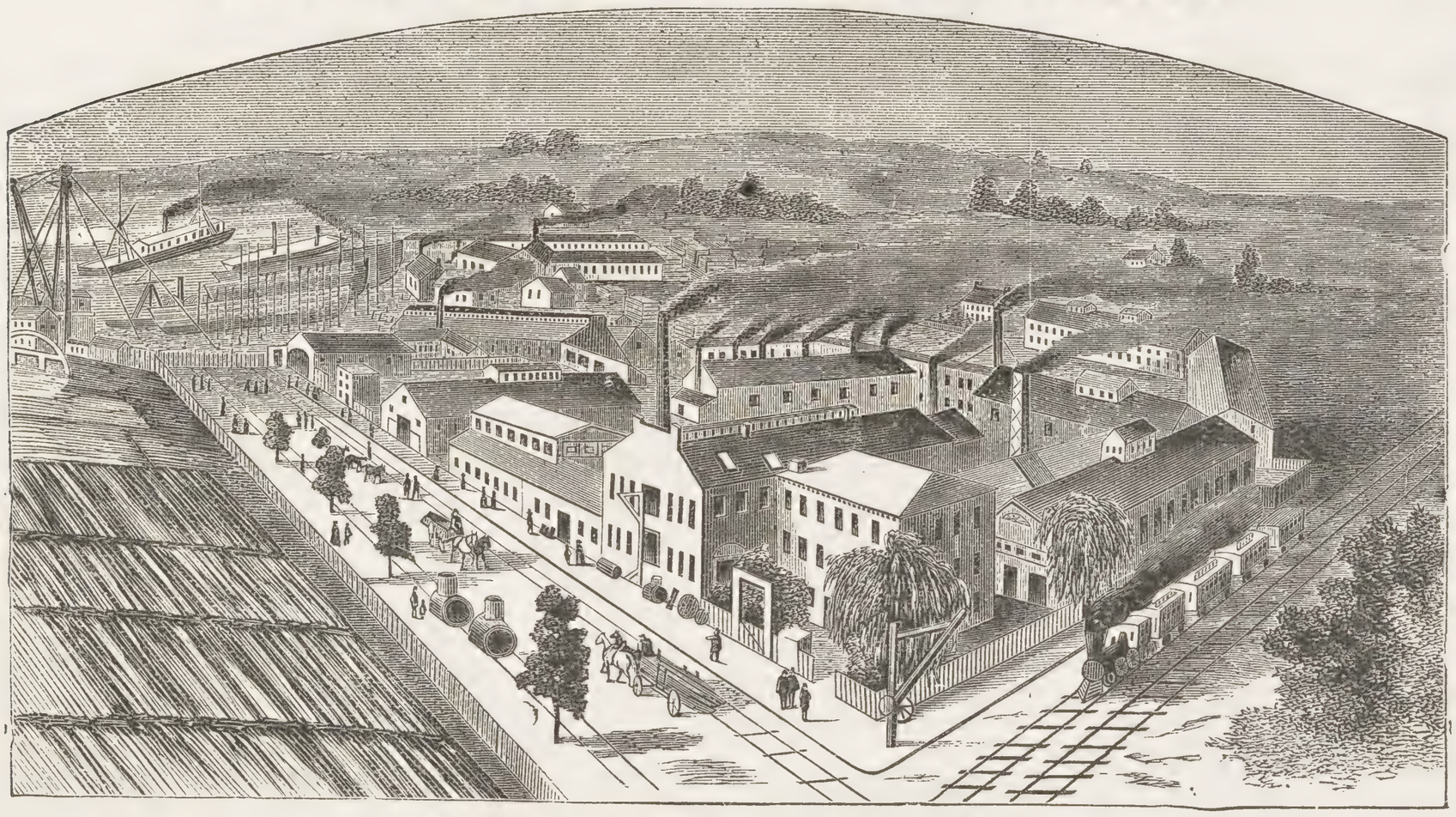
These **VARNISHES** are made with the greatest care and skill, from the best grade of stock, and designed especially for

RAILWAY CAR AND LOCOMOTIVE WORK.

They dry hard, and resist effectually the severest exposure to action of **Cinders, Smoke, or Climate,** having been tested for many years by the leading Railroads of this Country and have proved, for **brilliancy** and **durability,** fully equal to any of either Home or Foreign Manufacture.

THE HARLAN & HOLLINGSWORTH CO.,

WILMINGTON, DELAWARE,



BUILD ALL KINDS OF

RAILROAD CARS:

FIRST and SECOND-CLASS DRAWING-ROOM, SLEEPING, BAGGAGE, MAIL, and EXPRESS, BOX, and FLAT.

MURPHY & CO., NEWARK, N. J.,

MURPHY, SHERWIN & CO. CLEVELAND,

Varnish Makers.

We call attention to the following prices of our Varnishes especially adapted to Railway Uses, and submit that they combine more prominently than any others, the INDISPENSABLE REQUISITES for Railway Consumption. They are of heavy body, light color, quick drying, and are guaranteed to give a maximum of durability.

Wearing Body, (For Outside Finishing.)	**$5 50**
Hard-Drying Body, (For Under Coats on Cars.)	**5 00**
Rubbing Body, (For Under Coats on Cars.)	**4 50**
Inside Car, (For Interiors of Cars.)	**4 50**
Engine Finishing, (For Last Coats.)	**5 00**
Engine Rubbing, (For Under Coats.)	**4 50**
Japan Gold Size, (For Binding and Hardening Colors.)	**3 50**
C. M. Japan, (For Drying and Binding Paints.)	**2 00**
Black Enamel, (For Smoke Stacks of Engines.)	**3 00**
No. 1 Black, (For Iron-Work.)	**1 50**

UNIFORM SUPERIORITY IN QUALITY AND FIXED PRICE TO ALL will continue to characterize these goods, and Satisfaction in their use is assured.

JOHN JEWETT & SONS,

182 FRONT ST.,

New-York,

MANUFACTURERS OF

PERFECTLY

Pure

WHITE LEAD AND LINSEED OIL.

JEWETT & SONS PERFECTLY PURE WHITE LEAD TRADE MARK

JEWETT'S PERFECTLY PURE LINSEED OIL RAW, BOILED & REFINED.

JOHN T. LEWIS & BROS.,

No. 231 South Front Street,

PHILADELPHIA,

MANUFACTURERS OF

White Lead, Red Lead,

LITHARGE,

ORANGE MINERAL,

LINSEED OIL,

AND PAINTERS' COLORS.

JOHN T. LEWIS & BROS. WARRANTED PURE WHITE LEAD. PHILADA.

TRADE MARK.

☞ READ ECKSTEIN, HILLS & CO. ADVERTISEMENT.

Page 1.

THE DISNEY CAR COUPLER,

Patented June 24th, 1874. Manufactured by

F. E. CANDA & CO.,

CHICAGO, ILL.

Fig. 1.

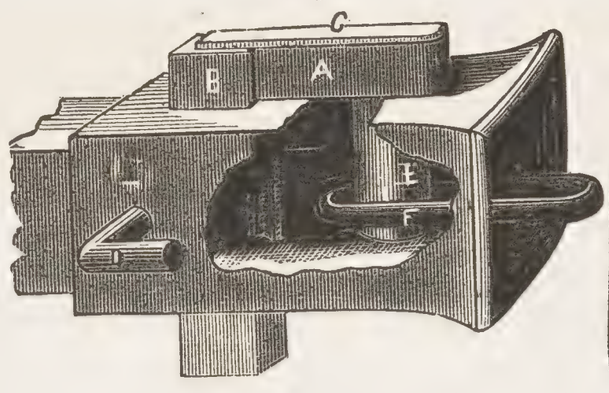


Fig. 2.

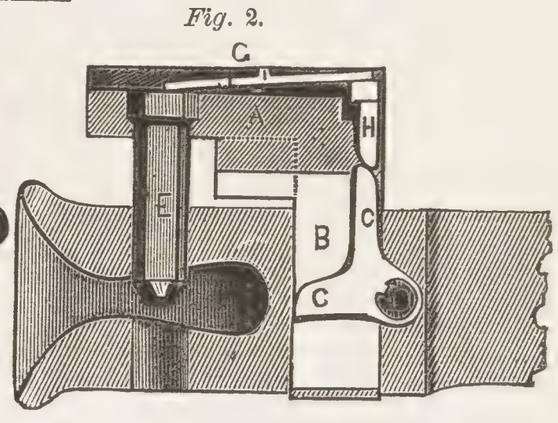


Fig. 1 represents the draw-head with a portion broken away to show the interior.

Fig. 2 represents a vertical, sectional view. *A B* we designate *The Drop*, the upper part *A* serving as the pin-holder. *D* is a lever by which the device is operated, fastened to a shaft passing through the draw-head. *C C* is a forked piece keyed to this shaft. *H* is a small loose pin. *E* is the large pin for securing the link *F*. *J* is a lever resting on the heads of pins *E* and *H*, with its fulcrum on cap-piece *G*. *Then*, when set for coupling or uncoupling, as in Fig. 2, the link *F*, in passing the mouth of the draw-head, raises pin *E*, which by lever *J* forces pin *H* against and displaces the upper arm of *C C*, allowing the *drop* to fall, carrying pin *E* with it.

From the above cuts and description it is apparent that this device combines simplicity in its construction, reliability in its working, and durability in all its parts.

We designate as points of special advantage:

That working from the side of the draw-head, it leaves no opening at the top for dirt, gravel, or accumulations of ice and snow to interfere with the working of the coupler.

That, while the link is always held in a horizontal position for entering, yet it has sufficient vertical movement to accommodate itself to cars of different heights, not exceeding a variation of six inches, without using the crooked link.

That the mouth of the draw-head is of such shape as secures the pin from all liability of bending or breaking.

That it always couples when desired, or set for coupling, and will *never* couple when not desired.

That, working readily from the top and sides of cars, there is no risk of life or limb.

That the pin can never be lost or stolen.

And further, *that* from its reliability of working, and durability of parts, combined with the device for securing it to passenger cars, makes *This Coupler* the safest and by far the most economical *Passenger Car* Coupler ever introduced.

The Disney Car Coupler, wherever tried or however thoroughly tried, has given the most perfect satisfaction, both as a Freight and Passenger Car Coupler.

For further information, address

H. C. KIBBE, 419 California St., San Francisco, Cal.,

AND

F. E. CANDA & CO., Railroad Contractors and Car Builders,

79 SOUTH CLARK ST., CHICAGO, ILL.

THE

Atlantic White Lead

AND

LINSEED OIL COMPANY,

Manufacturers of

WHITE LEAD,

DRY AND IN OIL.

RED LEAD AND LITHARGE,

CRUSHERS OF LINSEED OIL.

ATLANTIC WHITE LEAD. PURE. WARRANTED. ROBERT COLGATE & CO.

TRADE-MARK.

Robert Colgate & Co.,

287 Pearl St.,

NEW-YORK.

KATAHDIN CHARCOAL PIG IRON.

O. W. DAVIS, Jr., Manufacturer, BANGOR, MAINE.

SOUTH BOSTON IRON CO.'S TESTS OF KATAHDIN PIG IRON, 1874:

	Density.	Tensile strength per square inch.
No. 2 Pig Iron,	7,2002	18,894
" 3 "	7,2432	26,928
" 4 "	7,2305	30,765

Nos. 1 and 2 are soft and strong, suitable for machinery and fine castings, boiler plates and steel. Nos. 3 and 4 are close-grained and tough, adapted for steam cylinders, radiators, locomotive castings, car-wheels, hydraulic presses, etc. All grades contain less than one-tenth of one per cent of sulphur or phosphorus. Shipped by rail or water from Bangor to any part of the country.

THE NATIONAL CAR BUILDER.

DEVOTED TO THE INTERESTS OF RAILWAY ROLLING STOCK.

Vol. VI. No. 9. SEPTEMBER, 1875. *$1.10 per Annum. Single Copies, 10 Cents.*

Painting of Wrought Iron.

MR. E. SPON, in a paper read before the Society of Engineers, says:

"In considering the painting of wrought iron, it must be noticed that, when iron is oxidized by heating in contact with the atmosphere, two or three distinct layers of scale form on the surface, and, unlike the skin upon cast-iron, can be readily detached, as by the bending or by hammering the metal. The outside layer of this scale is more highly oxidized than the inner, and is slightly redder in tinge from the presence of a variable excess of ferric oxide over that contained in the inner layer. The oxide occurring in the outer scale is fusible only at a high temperature, is strongly magnetic, and slightly metallic in lustre; while the inner layers are more porous, dull, and non metallic in lustre, less brittle and also less powerfully magnetic. It will be seen that the iron has a tendency to rust from the moment it leaves the hammer or rolls, and that the scale above described must come away. One of the plans to preserve the iron has been to coat it with paint when still hot at the mill; and although this answers for a while, it is a very troublesome method which ironmasters can not be persuaded to adopt, and the subsequent cutting processes to which it is submitted leave many parts of the iron bare. Besides, a good deal of the scale remains, and until this has fallen off, or has been removed, any painting over it will be of little value. The only effectual way of preparing wrought iron is to effect a thorough and chemical cleansing of the surface of the metal upon which the paint is to be applied; that is, it is to be immersed for three or four hours in water containing from 1 to 2 per cent of sulphuric acid. The metal is afterwards rinsed in cold water, and if necessary scoured with sand, put again into the acid bath or pickle, and then well rinsed. If it is desired to keep iron, already cleansed, for a short time before painting, it is necessary to preserve it in a liquor rendered alkaline by caustic lime, potash, soda, or other carbonates. Treatment with caustic lime water is, however, the cheapest and most easy method, and iron which has remained in it for some hours will not rust by a slight exposure to a damp atmosphere. Although desirable, this method of cleansing the surface is impracticable in the majority of cases, and recourse must be had to scrapers and hard brushes to remove the scale or rust. Having obtained a clean surface, the question arises, what paint should be used upon iron? Bituminous paints, as well as those containing variable quantities of lead, were formerly considered as solely available, but their failure was made painfully apparent when the structures to which they were applied happened to be of magnitude, or subjected to great inclemency of weather or of constant vibration. Recourse has, therefore, been had to iron oxide itself, and with very satisfactory results. Iron oxide paints are made of two qualities. The first quality is the best adapted for iron work, and is made by purifying the oxides and placing them in retorts, when the various colors are mixed with them. They are altogether submitted to seven distinct processes in the course of manufacture. To insure large surfacing qualities, or the power of covering a large area with a small quantity of paint, the ingredients should be reduced to an impalpable powder before they are mixed with the oil; and after mixture in first quality paint, they are ground for seven or eight hours. The second quality have their colors chemically combined by mixture, and are not so carefully prepared, although they are excellent for common work. A pound of oxide paint, when mixed ready for use in the proportions of two-thirds oxide to one-third linseed oil, with careful work, should cover 21 yards of sheet iron, which is more than is obtained with lead compounds. Oxide of iron paint endures a very great heat without material alteration, and keeps both its color and preservative qualities well. The author is of opinion that, when used under proper supervision, no better protection can be found for iron structures than oxide of iron paints. There is this difference to be noticed between the painting of iron and wood, that, with the former, when a painter comes to spots of rust that can not be removed, he should endeavor to incorporate them with the paint rather than paint over them. The repainting of iron involves careful washing down and removing all dust, dirt, and so on from the entire surface, every particle of rust being scraped and chipped off, the work receiving from two to four coats in oil, properly applied. The author would observe, in conclusion, that the real value of any paint depends upon the quality of the linseed oil, the quality and character of the pigment, and the care bestowed on the grinding and mixing; and as all this is entirely a matter of expense, cheap paints are not to be relied upon. He is convinced that the superiority of most esteemed paints is due to the above causes rather than to any unknown process or material employed in the manufacture, and their comparatively high price corroborates this opinion.

So-called Practical Men.

ONE type of the practical man is of the "self-styled" variety, the most numerous probably existing. He is the least useful as an individual, the least progressive as a brain worker, and the least enlightened as a member of the human race, of any class of civilized mankind. He is a compendium of thumb rules, an epitome of set ideas encircled by the iron barriers of his own mind, which allows of neither the substitution nor admission of better views, nor the expansion of those within. At mere handicraft he may be skilled; but ask him for a reason and he is dumb. He it is who leads the van of the shriekers against free and liberal education, who clings to that sophism which argues that the "world is the best teacher;" who turns his son directly from the nursery into the shop; who renounces the inventor and all his works, until compelled by absolute force of circumstances to yield to progress; and finally who, having no knowledge other than his manual skill and set of thumb rules, scorns it in others.

"But we want no long-haired philosophers to run our shops," possibly thinks the reader. True, nor need we have them. "Science," says Lord Brougham, in his fine definition of the term, "is knowledge reduced to system." The true scientist is he who not only possesses this systematic knowledge, but, if he be so situated as to require its immediate aid, knows how to put it in practice. He is neither the sage who meditates erudite abstractions, nor the soi-disant "practical man" who devotes himself to mere system. He is eminently the man of practice, but of intelligent practice, who is a master of principles, of reasons; to whom the mere application of a truth is nothing as compared with the truth itself; the latter immutable, the former an idea to be changed as occasion may require or judgment suggest. Such is the person we mean when we seek the "practical man," not the blatant individual who thrusts himself forward under that title.—*Scientific American.*

Carelessness in the Use of Machinery.

AN exchange offers the following good suggestions to its readers:

If one who looks over the newspapers daily should compile the statistics of loss of life, or injury to body or limb by machinery, for one year, the aggregate would undoubtedly surprise the community. At least such is the presumption from the frequency of such records. We do not refer particularly to unavoidable accidents caused by defects in machinery, or sudden or unlooked-for contingencies, but to those that might be avoided by a moderate degree of carefulness. A large proportion of these are caused by handling belts, particularly throwing them on or off pulleys in motion. There is a right way and a wrong way to put on a belt. The belt should be first placed on the pulley at rest, and then run on to the one in motion. In some cases where the belt is heavy, or the shaft runs very swiftly, it is best to slow down the speed so that the shaft barely moves. Where this is impracticable, great care should be observed in mounting the belt on the pulley face. The operator should have a firm and solid foothold, and see to it that no part of his person or clothing gets between the belt and the pulley.

Belts running from overhead-shafts are frequently run off or on by means of a long stick, the operator standing on the floor. In throwing a belt off, the danger of accident is not great, but in running a belt on in this manner, the stick is liable to be caught and thrown with great violence, at the hazard of breaking human heads or valuable machines. The practice is reprehensible.

A common practice is to stand on the floor, and cast the belt on the face of the revolving overhead pulley. Once on, it must be held motionless in its place with

one hand, against the friction of the pulley face, while the other hand guides it on the loose pulley of the machine, or the tight pulley, if there be no loose pulley. The danger is obvious—the belt may catch in a projecting key, or the head of a set screw, or double under on the shaft, when it will wind up with a velocity corresponding to the speed of the shaft, and perhaps carry the workman with it.

It would seem to be within the bounds of inventive possibility to construct some cheap and effective implement for throwing on belts.

The practice of leaving long ends of lacings or torn-up flaps of splicings to catch into clothing and any projecting object is not a good one. Small and slight as are these leather thongs and scraps, we have known of painful accidents being caused by them.

Using fast and loose pulleys without a belt-guide, leads to deplorable accidents. A man was recently adjusting a pair of powerful steam shears, and by some means, and all unexpectedly to him, the belt on the loose pulley worked over on the stationary pulley, and set the shears in motion. His left arm at the time was between the blades, which, closing with great force, nearly severed the arm near the wrist, cutting through the flesh and bone, and leaving the hand hanging by a few tendons and the skin. The arm was amputated near the elbow. The shipper or belt-guide should have an automatic catch which secures the belt on either pulley. Many concerns use this preventive, and it is so easily applied, in one form or another, and is so certain in its operation, that it should be generally adopted. Unless the shafts are perfectly in line—a condition continually liable to change—and the faces of the pulleys are crowning, there is danger of the belt working from one pulley to another.

There are other careless practices among mechanics and those having the charge of machinery, which it is scarcely necessary to enumerate. The general thoughtless handling of machines, cleaning parts of machines while in motion, adjusting parts that should be at rest while being acted on, and other habits contracted by familiarity, should be avoided. A machine ought not to be trifled with. It has no remorse or pity. Once in its power, there is no escape with impunity. It should be managed with caution and constant care, for in dealing with machinery it is always better to be foolishly careful than foolishly careless.

Mysterious Boiler Explosions.

THERE was a time when people thought that boiler explosions were caused by lightning. Later, this theory was modified, and it was said that electricity was an active agency in boiler explosions, and to this day the latter theory is entertained by many. There has always been a desire to surround these accidents with mystery; to devise some theory that men of ordinary intelligence cannot comprehend. The promulgators of these theories have a fancy for surrounding themselves with an atmosphere of superior intelligence, somewhat akin to the alchemists and astrologers of old. They use unfamiliar technical terms and derivative words, when plain Saxon would be much more to the point, and this they call scientific. When a boiler explodes, people desire to know what was the cause. If they are entertained with theories of suspension or repulsion, when portions of the boiler were found corroded almost to the thinness of paper, they might very properly say "that's too thin." And if upon careful examination, it was pretty definitely ascertained that the boiler let go at the weak or thin point, any theory founded upon suspension or repulsion would be likely to have little weight with people familiar with steam boilers.

It is well known that any piece of machinery in which there is a weak point must be handled with great care. It must not be overloaded, but the load or strain must be adapted to the weak point. The theory that the strength of any structure is measured by its weakest point is as true of boilers as of any thing else; and when a boiler has a decidedly weak point, it should not be used except at a very low pressure. A safer way would be to repair at once, and thus approximately restore the boiler to its original strength. A boiler may be corroded in places difficult to discover unless a thorough examination is made when the boiler is cold, and the owner may not know that the pressure which he is using is close up to the ability of the metal at its weakest point. Under these latter conditions, it will be readily seen that a little excess of pressure only will be required to pass the limit of safety. The weak spot gives out, and damage to a greater or less extent occurs.

A weak spot in a boiler or any other device, does not improve by use; and when a machine breaks down at a point which is ascertained to have been weak for a long time, no one is impressed with the necessity of going into a long discussion to show that mysterious agencies were suddenly brought to bear upon the weak point, causing the break. The fact is the point of fracture was unable to sustain the load imposed upon it. It did its very best, but when the load was not lessened, yet the deterioration of metal continually went on, a time came when, from inability to hold on longer, the machine broke down. Is there any mystery about it? Is there any mystery about the fact that a boiler 6½ feet in diameter, running at a pressure of 75 lbs. to the square inch, with one of the sheets corroded to the thinness of paper, exploded, doing serious damage? We think not, and we further think all efforts to surround such cases with mystery worthy only of those who have soared so high into the regions of theory that they are reluctant to step down before, and into the presence of, facts and common sense. Boilers should be periodically inspected with much care, so that any indications of weakness may be discovered before it is too late. There are few, if any, defects that careful external and internal examination, with chisel and hammer, will not discover; and we would advise all boiler owners to secure the services of some competent man to examine their boilers carefully at least once a year. —*J. M. Allen, President of Hartford Steam Boiler Inspection and Insurance Company.*

Steel Rails on the Pennsylvania Railroad.

DURING the present year the Pennsylvania Railroad Company has purchased and laid down on its various divisions over 20,000 tons of steel rails and nearly 9000 tons of iron rails. The main track between Philadelphia and Pittsburg is now laid entirely with steel, and the New-Jersey division will have no iron rails by next April. The company first commenced to lay steel rails in 1860, and every year's experience demonstrates their economy. The immense traffic which now passes over this road makes the life of an iron rail a short one, and in certain localities it would be worthless in less than six months.

Iron rails, indeed, have been in continuous use for over thirty years, and a section of such a rail was lately shown at a meeting of the Franklin Institute; but then these rails have lain much of that period on sidings where there has been no heavy traffic. A good steel rail will stand the wear and tear of continuous use on the Pennsylvania Railroad for from seven to twelve years. Mr. Brown, Chief Engineer of Maintenance of Way, has in his office the section of a steel rail which has stood the severest test a rail can receive; and that was in the Pittsburg yard, over which the heaviest trains are continually being shifted. After seven years' use, on a curve, there seems no reason why there should not be two or three more years' service in it.

Experience has shown that a modification of the usual form of the T rail would make it more serviceable; and within the past year all the rails rolled for the company have been rolled with wider flanges and thicker heads, without increasing the standard weight of the rail—67 pounds to the yard—the material being taken from the shank or upright section. The form of the head has been changed, the section representing the frustum of a cone instead of being elliptical This is the form the head always assumes after use the flanges of the wheels wearing off the bulge of the elliptical head. The flange has been widened, which will prevent the rail, to some extent, from cutting into the ties, which suffer more from this than from decay.

The present amount of traffic over the road would make it almost impracticable to renew the track with iron rails as often as they would wear out, as from the great number of trains there would be no opportunity. The 20,000 tons of steel rails purchased will lay 207 miles of single track, and it is the intention to renew all the main tracks with steel. The sidings will be of iron. The first cost of steel, as compared with iron, is now about 50 per cent greater.

New Method of Making Nuts.

A RICHMOND (Va.) gentleman has invented a new method of manufacturing nuts, which is thus described:

Muck iron is rolled into the required shape to make a hollow pile, by forming two sides with top and bottom of half circle, octagonal or hexagonal exterior, or a square hollow faggot, just as may be desired. This pile is heated in the usual manner, and before being given to the rolls, a mandrel is introduced into the interior or hollow of the pile, which mandrel is held in position by being attached to the end of a rod or chain, the other end of which is supplied with a collar which falls behind a notched rest or brace which holds the mandrel in place as the pile is introduced to the bite of the rolls and passes through them Thus the exterior of the bars and the interior are formed at the same time, and the weld completed. The further reduction and finish of the bar is accomplished by a repetition of the manipulation in the successive use of smaller mandrels and smaller grooves in the rolls. Then, before the bar has lost the heat, it is given to a gang-saw, and by one movement cut up into blanks of the required thickness of exactly uniform size and weight, ready for the reamer and milling and chamfering machine. It is claimed that nuts can be manufactured much cheaper by this process than by the old methods; they are stronger, and consequently can be lighter, and thus more of them obtained from a given weight of iron.

UNION PACIFIC SHOPS.—It having been rumored that the company contemplates removing the car and locomotive shops from Omaha to some other point, the Omaha Herald states that recent and current works of permanent improvement, with a proposed expenditure of $20,000 on water works, render the rumor improbable. The car and building department now employs 288 men, and the locomotive department 450. The former, under the charge of G. E. Stevens, has, during the past six months, built, and has now in course of construction, 66 coaches, and 25 more to build as soon as the work can be done. The road has 100 coaches in service, 9 mail, 9 express, and 19 baggage cars, and all the cars now in use were built at these shops. The shops have been for eighteen months engaged in the construction of box cars—from 15 to 25 a month. Last month, 20 were built and sent to the rolling mills at Laramie, and recently 21 coal-cars were built and sent out to the coal mines at Rock Springs, Wyoming, and there are to be built 42 more. Within a few weeks, this department has supplied 100,000 feet of lumber for improvements at the Ninth street depot, and an equal amount for the freight buildings at Spoon Lake; also a hotel at Sidney, Neb., the material having all been shipped ready dressed and framed, and the building erected by workmen from the building department. This department also does its own silver-plating. All the stoves used in the cars and section-houses, depots, and telegraph-stations along the line are furnished by the building department.

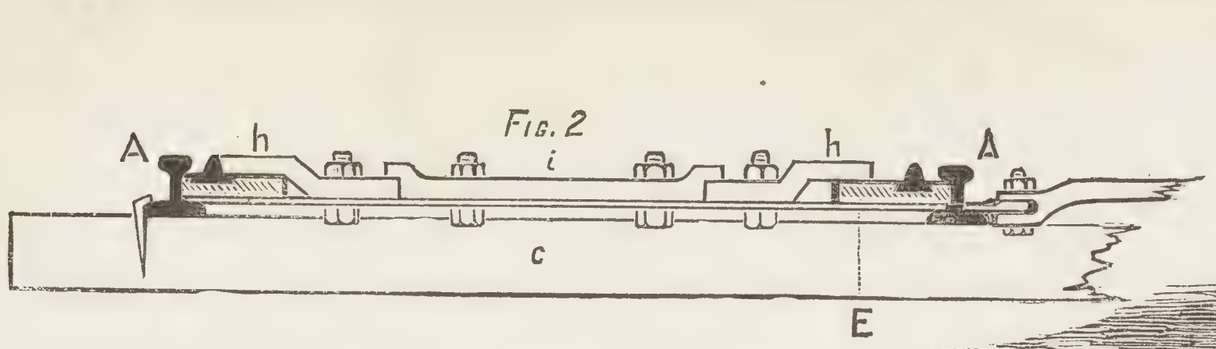


FIG. 2

FIG. 1.

FIG. 3

FIG. 4

A New Railroad Safety-Switch.

THE engravings represent a safety-switch which has been in practical operation for several months past for the purpose of testing its qualities, and with the most satisfactory results. The inventor is Mr. Charles H. White, for many years, and until recently, roadmaster of the Michigan Central Railroad. The construction is such as to enable trains to pass from the main line to a siding, and from a siding to the main line, without crossing, running over, or shifting the main line rails. This is accomplished by means of guide-rails placed inside the track, and so arranged that by being shifted a few inches, the train is changed from one track to the other, but in no event can it leave the rails, no matter how the switch is set, or from which direction the train may come. These guide-rails are flat bars of hammered iron, the outer edge and points of which are of cast steel, and mortised to overlap the end of the frog-point when shifted against it. They are coupled at one end (through a mortise in the web of the main rail) to the ordinary switch-bar, and at the other end to an iron cross-tie fitting between the rails. The frog-point, which is another important feature of the device, is of cast steel, and is dovetailed into an iron bed-plate in such manner that when it is worn out it can be removed and replaced by a new one.

Fig. 1 is a view of the track with switch in working order. Fig. 2 is a cross-section through the main connection, A A being the track rails, *h h* the guide rails, *i* the brace between guide rails, and C the tie. Fig. 3 shows the form of the steel point, and Fig. 4 the bed-plate or sill with dovetailed seat to receive the point.

The essential advantages of the arrangement are: It obviates the danger of open switches; no part of the rail on which the wheels run can be moved; there is no break in the rails, and consequently no ends to hammer down; the wearing parts are of steel and easily replaced without disturbing the rest of the structure; it lies up from the ground and is not easily clogged with snow or ice, nor is its working affected by expansion in hot weather. It is simple in construction and costs no more than any other first-class switch, and is highly recommended by W. K. Muir, late general superintendent of the Detroit and Milwaukee R. R., George C. Kimball, general manager of the Chicago and Michigan Lake Shore R. R., J. M. Berrien, late chief engineer of Michigan Central R.R., and by other experienced and practical railroad men.

It is manufactured by the Michigan Car Company, at Detroit, and is furnished complete with standard (without lamp) as in drawing

Car Ventilation.

A TEST was recently made on the Michigan Central Railroad, of a method of ventilating passenger cars, of which Winchell, Durham & Co., of Chicago, are the proprietors. The trial was made with a car built by this firm for the express purpose of exhibiting and testing the merits of this particular method of ventilation, and the results are reported as very satisfactory. A number of prominent railroad men were present on the occasion and witnessed the experiments.

The method consists of an air-chamber extending the entire length of the deck or dome of the car roof. This chamber is of the same width as the deck, and about four inches deep, and has at each end a hood about six feet long and 18 inches deep, the mouth of which is covered with fine wire gauze. In each hood is a cut-off for regulating the quantity of air admitted, and which can be operated by a rod from the inside of the car. Registers are placed along the bottom of the air-chamber for admitting the air into the car, and are always kept open. In summer, the forward cut-off is kept open and the rear one closed. A current of air, when the train is moving, is thus constantly forced through the netting into the chamber, and through the registers into the car. The registers being directly over the center of the aisle, the passengers are not annoyed by the draft. In winter the front cut off is closed and the rear one opened, the air-chamber then acting as an exhaust—sufficient fresh air being supplied from other sources.

Another important feature of the plan consists of deflectors of plate glass, two of which are attached to each window, and all of them operated by a rod running the whole length of the car. They are 18 in. long and 5½ in. wide, and set in malleable iron frames. The front one stands out from the window at an angle of 45°, and the rear one is swung into the open space of the window. When the car is to run in the opposite direction, the deflectors are all reversed by a single motion of the rod. When the car is in motion, and the windows open, these deflectors act as exhausts, drawing the foul air, smoke, etc., from the interior of the car. They also prevent smoke, dust, cinders and rain from coming through the windows. Coming against the deflectors they are turned aside and the current of air passing out of the windows carries them away.

The condition of the car thus ventilated, as compared with the others of the same train, showed that the device worked well. There was no annoyance from cinders, and the cigar smoke passed directly from the smoker's lips to the windows and out of the car. As it rained during most of the trip, there was no dust; the deflectors kept the rain from coming in at the windows, and the cinders that were found adhering to the outside of the wet deflectors showed how well they were intercepted.

The foregoing is condensed somewhat from the Chicago *Railway Review*. The plan will doubtless work very well for summer ventilation when the windows are kept open; but in winter when open windows are the exception and not the rule, and when heating becomes a necessary element in the problem, we can not but think that this plan would prove less satisfactory. Exhausting the air through registers along the center line of the dome, would necessarily draw in a corresponding quantity of cold air at the bottom, or wherever the supply openings were, to say nothing of the unnecessary waste of warm air thus caused and consequently of fuel. The great trouble in winter is to secure sufficient ventilation, and at the same a uniform and comfortable temperature in every part of the car, and especially next the

floor where the passengers' feet are. We very much doubt if this difficulty can be effectually overcome by any system which lets the air out at the top; on the contrary, we think it can only be done by exhausting the air at the bottom, a method which is getting to be very generally recognized as an indispensable one in the warming and ventilating of buildings, public halls, and apartments of every description.

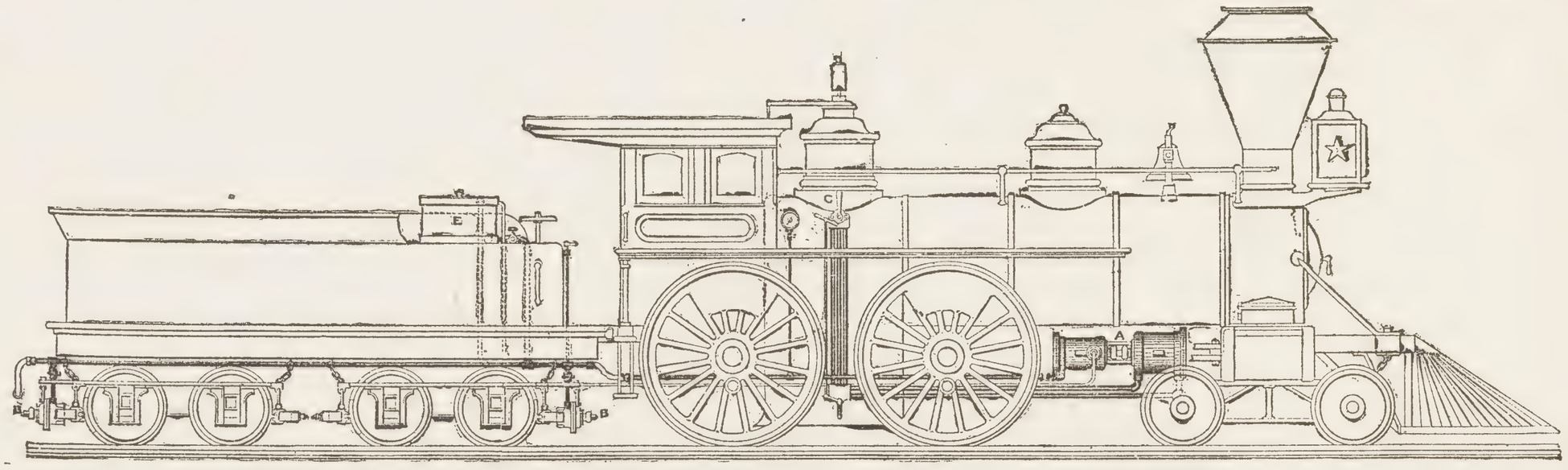
The cost of attaching the Winchell device to old or new cars does not exceed $25. This, however, does not include the deflectors; the cost, including these, will be from $85 to $100.

Cheap Passenger Trains.

The Railroad Commissioners of Massachusetts, in a recent report, refer as follows to the results of the experiment of cheap trains on the Eastern Railroad: "They have been in use on this road for nearly three years, and their success has exceeded all expectation. They were established on that road in compliance with a suggestion of this board, and with great doubts publicly expressed whether any real demand for them would be found to exist. They had been in operation less than one year, when the financial troubles of 1873 came on, but the statistics of the corporation show, as appears in the last report of this board, that the number of passengers traveling in them increased forty-two per cent in 1874 over the number carried in 1873, or from 187,016 to 266,560. During the first seven months of the present year also, notwithstanding the general depression of the railroad business, the board is further informed that the increase has been 7.8 per cent over the corresponding months of last year, or from 129,810 to 139,930. Neither is there any evidence that this large increase in travel on these particular trains represents simply a corresponding decrease of more remunerative travel on the regular trains of the Eastern Road. On the contrary, during the present, as during the previous years, the returns from the stations served by the cheap trains show conclusively that the increase in the number of passengers on the regular trains is as large as it has ever been before. The returns indicate, therefore, that the cheap trains have called into existence a new and reliable description of travel which does not confine itself to them, for, while the increase of passengers on the working men's trains during seven months of this year has been 10,120, that on the regular trains from the same stations has been 12,784. The board also understands that the running of the cheap trains has largely contributed to the settlement of the territory served by them, and in this way indirectly to the general receipts of the railroad company. Neither does the Eastern Railroad in any way profess to consider the running of those trains as a burden of which it would gladly be relieved; but, on the contrary, its officers freely acknowledge that the experiment has proved surprisingly successful, and for that reason, of their own option, and without any request from the board, they have extended the system to other portions of their line. A similar train has also voluntarily been placed on a portion of its line by the Old Colony Railroad Company, in this State, and the Philadelphia and Reading Railroad Company, in Pennsylvania. These trains on the Eastern Railroad are also run at rates of fare excessively low, twenty tickets, good for as many trips upon them, being sold for $1. This rate was originally fixed at the suggestion of this board, for the avowed object of testing the experiment at such rates of fare as would preclude all possible question as to its thoroughness. If it broke down, it was not to be said that it was because it was not cheap enough. Even at these rates the trains have proved remunerative. The experiment having, however, been fully tested, the board is not prepared to urge on other corporations rates equally low, and in recent cases has adopted the scale of fifteen tickets to the dollar, or an increase of twenty-five per cent on the Eastern Railroad rates."

An English Invention.—"Priming," or the carrying of water in the steam from the boiler into the cylinder, often causes trouble and damage to the engine. To prevent this, and obtain a dry steam, a dome is fixed to the top of the boiler from which the steam is taken. A recent English invention aids this by fixing an upright pipe next the dome, having suitable connections with it and the bottom of the boiler. In this pipe is secured a circular winged deflector, or propeller-shaped helix. The steam in passing this is given a whirling motion, and the water it holds is thrown out by the centrifugal force, and falls back into the pipe that leads to the bottom of the boiler. A stop-valve prevents its return, and the apparatus is said to be a practical success.

Hardening Small Tools.—It is said that the engravers and watchmakers of Germany harden their tools in sealing-wax. The tool is heated to whiteness and plunged into the wax, withdrawn after an instant, and plunged in again, the process being repeated until the steel is too cold to enter the wax. The steel is said to become, after this process, almost as hard as the diamond, and when touched with a little oil or turpentine the tools are excellent for engraving, and also for piercing the hardest metals. English engravers often use soap or white wax for the same purpose.



The Henderson Hydraulic Brake.

At the recent trial of continuous brakes in England, there were two—Clark's and Baker's—which were operated by hydraulic pressure. They were reported as having a fair promptness of action, but that the water was liable to freeze in winter; and in case of a break in the train, they could not be made automatically available.

The Henderson Hydraulic Brake, of which we gave some account in the Car-Builder about a year ago, and which has been in successful operation for the last twelve months on the West Chester and Philadelphia Railroad, does not appear to be liable to the objections named; and we again refer to it as a device which is entitled to the favorable attention of railroad men, and especially so, if the advantages claimed for it are not exaggerated. The power is supplied by steam from the boiler to a double acting pressure-engine A, under the forward part of the locomotive, the valve C being worked by the engineer. In each cylinder of the pressure-engine is a piston, one of which is actuated by the steam, and the other acts upon the fluid, forcing it through the pipes and into the pressure-boxes B B attached to the break-beams. The water can be supplied from the tender-tank, or from a special one, as shown at E. To prevent freezing at low temperatures, a quantity of glycerine is combined with the water, and when the two are used in equal proportions, it is safe from freezing at 24° Fahrenheit below zero. The pressure-boxes are of cast iron bolted together, and embracing a dish-shaped diaphragm of vulcanized rubber. The body-casting is of similar form, but somewhat deeper; a ram is fitted to the hollow of the diaphragm, its reduced diameter passing through a projecting guide, furnished with hydraulic packing. Two iron rods connect the end of the ram to the opposite brake-beam. When pressure is applied, the body-casting presses in one direction, and puts its brake on, and the rams going outwards draw the opposite brakes on—the movement of the rams being from one-half an inch to one inch. When the pressure is relieved, by the retraction of the press-piston, the atmosphere re-acts on the area of the rams and forces them back, assisted by the tendency of the diaphragms themselves to recover their normal condition. Double iron pipes are used under the tender and cars. A branch, governed by a 3-way cock, connects again with the tank above the fluid level, by which the engineer can blow around the whole double line of pipes to clear them of air before starting. Flexible hose between the cars is used, furnished with hydraulic couplings, which it is obvious must be tight, both with and without internal pressure, and couple and uncouple without waste—peculiarities possessed by this coupling alone, which also has a lock-joint and safety disconnecting chain attachment, preventing the coupling from ever blowing apart. These, with the steam valve and a few fittings, comprise all the machinery of the brake.

The pipes are coupled at the end of the rear car, making the fluid circuit complete, while there is no chance of leakage. The only yielding parts being the pressure-boxes and diaphragms, the power is expended at these points alone and just where it is wanted to apply the brakes, dispensing with cylinders under the cars and all necessity for levers, joints, chains, springs etc., and in a manner that does not interfere with the working of the brakes by hand. The double system of pipes allows the brakes to be applied simultaneously at the rear and front ends of the train. Either line of pipes can be cut loose between the cars without affecting the braking of the train, or any single truck, or more, may be shut off from connection with the brake power. The engineer knows the amount of retarding force he can apply to each wheel, 100 pounds of steam pressure bringing 9400 lbs. to bear against each pair of wheels, and a greater steam pressure a correspondingly greater retarding force.

The apparatus appears to have the merit of simplicity and cheapness. The boiler being the reservoir of power, the brake is ready for action when steam is up, the application of the power being direct and instantaneous. More detailed information may be obtained from the Henderson Hydraulic Brake Co., 119 South Fourth st., Philadelphia.

The Wason Company, Springfield, Mass., has commenced its South American contract for 44 freight, 20 construction, and 9 passenger cars, and its extensive order for passenger cars for the New-Jersey Central Railroad.

Steam Street-Car Construction.

Mr. Henry F. Knapp, in a paper recently submitted to the Rapid Transit Commission now in session in this city, makes some very practical and excellent suggestions relating to the subject of steam-impelled street-cars and their machinery. Mr. Knapp is opposed to trains of vehicles, and believes that each car should be built to carry from 50 to 100 passengers, and be self-propelling. The machinery he would place beneath the floor, so as to leave the entire area of the latter unobstructed. The heat radiated from the generator would be shielded from the bottom of the car in summer, while in winter it could be utilized to warm the interior.

The only way of getting rid of exhaust steam, that terror of horses and bugbear of inventors, is to run it into a fan blower where it will be mixed with two or three times its volume of atmospheric air, which subtracts its heat and reduces it to water so quickly that a fine mist is ejected from the blower. The products of combustion (smoke), consisting of carbonic acid, carbonic oxide, steam, and such portions of carbon as may have escaped unburnt, may be most completely reduced by being forced through a reservoir or tank containing milk of lime by the blast that is used for feeding air to the boiler furnace. The lime takes up in combination all the carbonic acid, for which it has great attraction, and retains the particles of escaped carbon, cinders, etc., in suspension, besides entirely condensing the steam of the smoke in a liquid state, thus leaving nothing but free and invisible nitrogen to escape into the atmosphere.

Freight-Car Mileage.

Mr. C. A. Grow, Auditor of Motive Power and Machinery Department, Central Pacific Railroad, writes as follows to the *Railroad Gazette*, in regard to the practicability of keeping the mileage of freight-cars and also of car-wheels:

"I commenced in 1870 an account of the mileage of cars, and at the same time a record of wheels. This record shows the mileage of *all cars* in service, with date put in, taken out, name of maker and cause of removal. I had several reasons for commencing such records, among which were the following: That we might calculate, or at least have a basis for calculating, the relative monthly or yearly expense of maintaining our cars; also that we might know positively what our wheels were doing. We soon found that the second reason was of greater importance than at first anticipated. Our wheels were purchased in Eastern markets, and mostly under a guarantee of running a given number of miles. It was soon made apparent that none were fulfilling the 'contract nominated in the bond,' which led to investigations, resulting in various facts hitherto unknown; among others, that a large proportion of wheels being removed were from the result of being flat, which, while being no defect in the wheel, brought to prominent notice a wrong system prevalent among train-men on most roads, *i. e.*, that of making the brakes of one car, oftentimes, do the work of two or three. We have cases on record where wheels put under cars on our Mountain Division were flattened and completely spoiled in their first run of less than 120 miles. These facts, and others obtainable from our records, when laid before proper authority resulted in a more equal distribution of the strength of our brakemen, whereby they made other and more wheels do the service formerly performed by a less number, and this of course resulted in a material decrease in the number of flat wheels. In addition to these local difficulties, which when known are so easily remedied, we soon were enabled to tell what make of wheels was serving us best, and in purchasing could be governed by a knowledge of what each make of wheels had actually done on our own road, and were not obliged to stand a comparison on wheels whose life or service was based upon the number of days or months they had been in service. This knowledge, which can only be arrived at through a system of keeping the mileage of cars from which the wheelage is obtained, affords the purchaser information which is at once valuable to him and others buying or using wheels. The manufacturers of wheels, when once aware that a record of the service of all wheels is being kept upon all roads, will, to say the least, naturally feel like knowing that they are selling good wheels; while perhaps under other circumstances "ignorance would be bliss." Of the expense of keeping up the reports and records necessary to make them of value, I do not purpose to speak. Whatever it may be, I am firmly of the opinion—and I think our general superintendent and master car-builder will bear me out in it—that it does pay to keep car mileage."

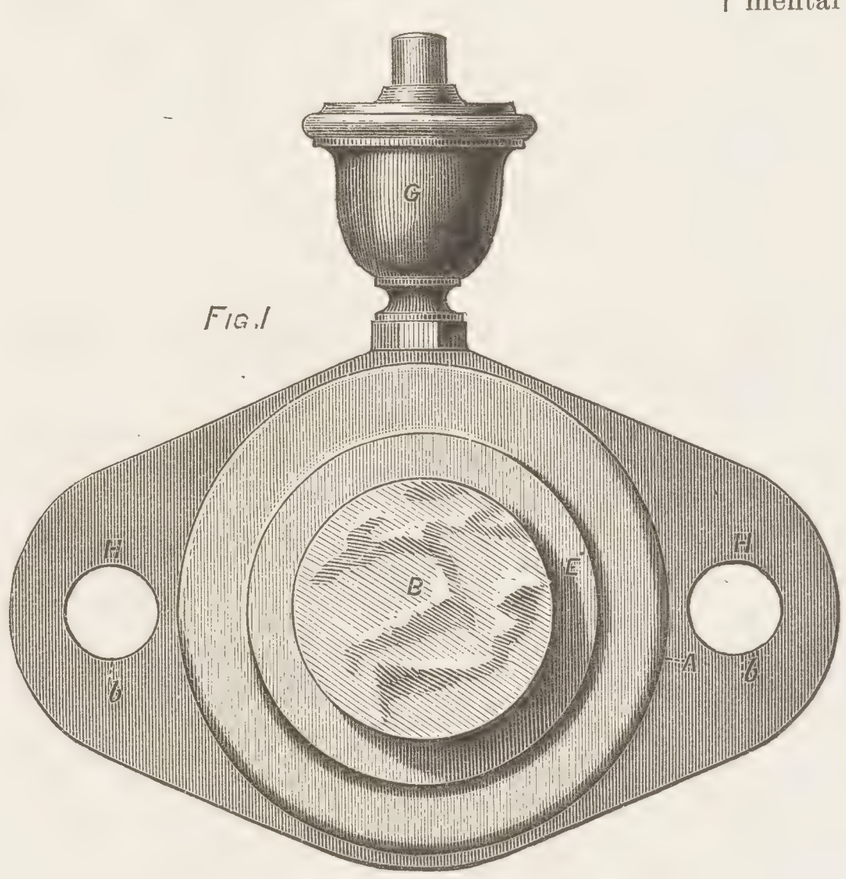


Fig. 1

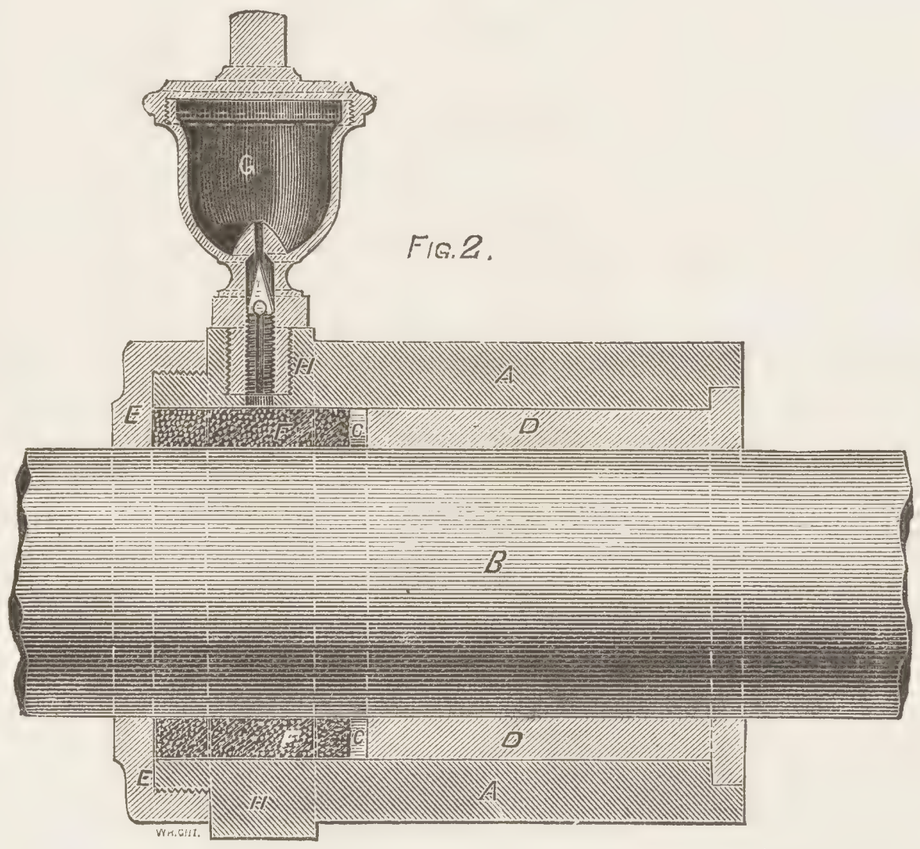


Fig. 2.

Improved Piston, Pump and Valve-Rod Gland.

The purpose of this invention is to provide for the lubrication of piston, pump and valve-rods, by means of an oil-distributing pad made of waste or other suitable material, and held to its place around the piston, as shown in the cuts. Fig. 1 is a cross sectional view, and Fig. 2 a longitudinal section, showing the relation of the several parts, A representing the gland, B the piston rod, C an annular chamber between the bushing D and the nut E. Within this chamber is the pad F, which is fed with oil from the reservoir G, the supply being regulated by an adjustable plug. The operation of the device is automatic, the requisite quantity of oil, and no more, being admitted to the pad, thus preventing waste, and keeping the rod at all times properly lubricated. Manufactured by the American Railway Improvement Company, Harrisburg, Pa.

Wooden Rails.

The feasibility of wooden rails is being tested on a portion of the Muncy Creek Railroad, an unfinished line of 40 miles, in Lycoming County, Pa. Mr. H. R. Mehrling, the superintendent, has recently had 700 feet of track laid on a curve just beyond Muncy Creek, and to the surprise of all it has been found to answer the purpose much better than was anticipated. The rails are of sugar maple, seven by four inches, and about twelve feet in length. The ties are laid down in the ordinary way, notched, and the rails "let into them" about four inches. They are then keyed firmly with wooden wedges driven on the sides, which makes the track very solid and firm. The locomotive and heavy cars have been passed over this experimental track at different rates of speed, and it has been found to work admirably, and give every assurance of success. The cost of laying wooden rails, manufactured out of this hard material—that becomes almost as solid as bone when seasoned—is $450 per mile. Iron costs $4000 per mile. No iron spikes are required, as the rails are secured with wooden wedges, and the cost of track-laying is about the same as putting down iron. These wooden tracks have been tried at different places in the country, and invariably been found to work well. The highest rate of speed for locomotives to pass over them with safety has been fixed at sixteen miles per hour, but even if this rate were reduced to twelve or ten miles, the saving in expense would more than compensate for the reduction in speed. It has also been shown by experiment that these wooden rails will last, ordinarily, from three to four years, which is another important item to be taken in consideration.

The highest bridge in the world will be built at the crossing of the Kentucky River, on the Cincinnati Southern Railway, near the Shaker ferry. The Baltimore Bridge Company, one of the most noted in the United States, has secured the contract. The bridge will consist of an iron deck truss of three spans of 375 feet each, centre to centre, supported by two piers and two abutments. The piers will be built of masonry to a height of 64 feet and 6 inches above low-water mark, and the additional distance below low-water mark will soon be determined by borings under control of the resident engineer. These piers will be 120 feet long end to end of cut water, and 35 wide on the top, built hollow, with the walls 24 feet from the end. Upon the masonry will rest the iron trestle-work. The grade line is 275 feet 6 inches above low water. The abutments will be built upon the cliffs on each side of the river, and are to be 48 feet high, depending upon the shape of the ledges of rock.

The following is given as a simple welding powder: 1 part dry borax, 1 part fine iron filings, ¼ part prussiate of potash; it is sprinkled on the surfaces, the latter being previously slightly moistened. The pieces of iron and steel are then tightly bound together with iron wire, heated to about 300°, and lastly placed under a steam hammer or passed through rolls.

An engine has been invented in Paris which is driven by the alternate expansion and contraction of oil or some other liquid, contained in cylinders. The liquid is heated so as to expand by the application of hot water passing through small tubes, and cooled so as to contract by means of a refrigerating mixture similarly applied.

Iron and Steel Railway Axles.

To the Editor of the National Car-Builder:

DEAR SIR: In the August number of your journal I find an article on the subject of Steel Railway Axles, copied from the *Iron Age*, in which the writer refers to sundry tests made in New-York and elsewhere, of the comparative strength of steel and iron axles. These tests consisted in dropping weights from various heights upon the centre of the axles, and noting the deflection caused by such blows, etc. So far as this kind of testing is concerned, it may prove something, but not what is to be desired in the way of reliable results.

It is not to be wondered at that some master car-builders and master machinists are perplexed in regard to the use, behavior, and application of cast steel, when all things are taken into consideration. I do not propose at this time to consider the reasons for such perplexity. The use of steel, without regard to its kind and quality, has not always proved to be a good substitute for the best of iron, as experience has shown; and it must be conceded that experience is rather an expensive way of getting at some kinds of facts.

Some eight or ten years ago, a series of Formulas and Tables for the Shafting of Mills and Factories, by James B. Francis, C.E., of Lowell, Mass., was published in the *Journal of the Franklin Institute*, and subsequently in pamphlet form, and to which I would call the attention of your readers. The investigations described and tabulated in this publication were for the purpose of determining the relative fitness of wrought iron and cast steel for shafting purposes in a cotton factory; and as bearing upon the subject of this communication, are especially worthy of the attention of railroad managers, by showing the necessity of such investigation on their part, in cases that are analogous, and before the material is put to use. The tests and experiments noted by Mr. Francis were made from the supposition or idea that if cast steel of good quality could resist a strain of torsion and deflection corresponding to its tensile strength as compared with that of iron, it would be a proper material for shafting, the object being to move as little dead or useless weight as possible. At the time referred to, a new cotton mill was about to be erected in Lowell, and I proposed to Mr. Francis to put in steel instead of iron shafting. He thought favorably of it, but remarked, in his emphatic way, that it had better be tested first. Arrangements were accordingly made for that purpose, the factory company furnishing the necessary apparatus and I furnishing in part the steel. The experiments were conducted by Mr. Francis in his usual careful and thorough manner, and the results arrived at were quite different from what were expected, but indicated very plainly what was the best material to be used. The test or sample pieces of steel were all manufactured in the United States. Pembroke iron had more torsional resistance than the English refined iron, and was at that time the best material for the purpose. Forged iron, like that of the best car-axles, would probably have shown better results, and been almost equal, perhaps, to some kinds of steel. The high tempered or spindle cast steel required the greatest weight to produce a fracture, but a steel of this description would be unsuitable for car-axles on account of its liability to break at a corner, or where there is a small nick or a flaw. The deflection tests favored decarbonized cast steel of a very low temper; it would not harden in water, and was as near to the best of iron as any cast steel can be made. How the Pembroke iron stood this test, Mr. Francis does not say, nor does he mention its tensile strength, but it would probably not be more than 60,000 lbs. to the square inch. A very important part of an axle test is the torsional strength, which can not be shown by a drop weight.

These experiments, made by a manufacturing company in the matter of shafting, suggest the still greater necessity of the same class of experiments being made by railroads. The same bar of iron or steel, or pieces of it, hot as well as cold, should be tested so as to show its resistance to torsion, deflection, and tension. Such tests with iron or steel, so far as I am aware, have been made at the ordinary atmospheric temperature, or not exceeding 800° Fahrenheit. This latter test was made ten or twelve years ago by Prof. Treadwell. The results at that heat were about the same as his cold tests; with the same iron in an annealed condition, or after it had been heated to a red heat and cooled, it showed itself to be a very different thing, and the results were unfavorable as compared with his previous experiments, so far as tension was concerned. How it would be with steel does not appear, but it may be presumed to be reduced in strength. This is a point involved in the issue between the advocates of steel and iron car-axles; and if any tests have been made with hot iron and steel calculated to develop additional facts in this direction, I would be glad to hear of them. In bridges and other structures, cold iron is used, and consequently no calculations are made in regard to hot iron.

Railway car-axles are probably at times in the condition of Prof. Treadwell's annealed iron, and sometimes very hot, and perhaps occasionally nearly or quite red-hot, a condition, so far as torsion and deflection are concerned, I will not try to imagine. Car-axle journals have been allowed to run hot, from necessity, to where the car can be stopped, the journals cooled, and new brasses and oil put in. This may be repeated until the journal is reduced to a certain diameter; then, in accordance with custom, the axle is discarded, not from any weakness caused by the journals getting hot, but because they are worn down. They may wear gradually with no injury to the axle, and they may be nearly ruined the first time they get very hot. What would be the results of the tests of axles that had been hot or red-hot, would very likely surprise us; and I look for the time when a hot journal will be a sufficient cause for discarding an axle, whether it is made of iron or steel.

The writer of the article to which I referred at the outset, says, that "steel axles have been placed under cars on several different railroads, and in each case have been abandoned on account of their liability to heat." I am inclined to think there is some mistake about this, as I question whether there is any thing in the nature of steel that renders it more liable to heat, when in the form of journals, than iron is. The liability ought to be the same, with the same lubrication.

The master car-builders, in their conventions, are pursuing a laudable course in order to get at the facts in many things that are now imperfectly understood. Experiments should be made with iron and steel axles at any and all temperatures and conditions to which they may be subjected in actual service, and with different kinds of metal. Hot axles should not be allowed to run when the oil evaporates by heat from the journals, or when it will ignite from the blaze of a lamp or lighted match. Steel of a good quality and low temper will probably answer the purpose of iron at a much less weight, if kept comparatively cool. Should not the car-builders have adopted a standard as to the *quality* of axles as well as in regard to size? The very large size they have adopted will probably in many cases make up for an inferior quality of iron, and to a certain extent guard against injury or damage. If we wished to bend, break, or cut off a journal, we would most naturally heat it if made of good iron; if made of steel, we would heat it to bend it, but as regards breaking, it would depend upon whether the steel was high or low tempered. G.

THE Loughridge Air-Brake has recently been put upon some of the passenger cars of the Cumberland and Pennsylvania Railroad with the most satisfactory results. The road has a succession of heavy grades, some of which approximate 200 feet to the mile. The Piedmont, Va., *Independent*, in describing the operation of the brake, says that in going down the grade to Mt. Savage, which is at least 180 feet to the mile, the train was stopped without the least perceptible jar. As an illustration of the great necessity of such a brake on this road, the writer says that on the return trip to Cumberland, the engineer, Mr. Adam Johnson, discovered, on rounding a curve, that there were some cattle on the track. We were then descending the grade at a speed of about 23 miles an hour. To our mind, it looked as if there would be a dead cow, a wrecked train, and an editor's funeral. But a slight movement of the engineer's left hand on a small lever, a little hiss of escaping air, and the train was going no faster than a baby can toddle. The cattle were driven from the track, and once more the train sped on its way. At every station the cars were halted just at the platform, without the toot-tooting of whistles heretofore heard. That the brake is a grand success is fully proven by its efficacy on this road, and there is little doubt that the enterprise of the company in providing such safeguards will be fully appreciated by the traveling public who use the road.

A NEW Steam-Brake has been patented by Mr. J. A. Pendergrast, who was formerly foreman at the Huntington machine shops of the Chesapeake and Ohio Railroad, which is thus described by a local paper: "The plan is simply a cylinder and piston underneath the tender, with a small steam-pipe communicating from one end of the cylinder with the boiler. The piston is connected with a ratchet, which operates by means of a cog-wheel, a barrel on which a chain is wound, connecting with all the brake-rods on the train. By letting the steam into the cylinder, the piston is driven out and operates the barrel, winding up the chain with an immense power and checking every wheel. Mr. Pendergrast has applied his brake to the cars on the East Kentucky Railroad, running from Riverton to Grayson. We saw letters from the Superintendent and Chief Engineer last week, who are delighted with it. They say it works admirably and they can, if desired, slide every wheel."

ECONOMIZING WOOD.—As humanity multiplies, animals and trees must diminish. Already the forests are being so rapidly destroyed by the progress of art, fires, and carelessness of proprietors, as to excite an apprehension of a scarcity of timber very much sooner than formerly imagined. In short, wood for all purposes is already dear and becoming more costly. Tens of thousands of sawmills are rasping sawdust enough annually to freight a navy—a very small part of which is utilized in packing ice. It might and ought to be all saved and manufactured into planks, floor boards, and moulded into vessels, furniture, and hundreds of forms in which it might be used, instead of going lamentably to waste. When mixed with insoluble glues and pressed, as it may be, there is no calculating the profit that is yet to be realized in manufacturing sawdust. A new source of industry that would give employment to immense numbers of laborers and ingenious artists is in the future.

A NEW mode of manufacturing screws has been introduced at Edinburgh. By this method the screw, instead of being made as at present, by cutting away the iron of the bolt to leave the thread, is formed by rolling the screw on the bolt blank while hot. It is claimed for this process that a great saving of time and labor is effected. Recent experiments showed that the tensile strength and the holding power in both soft and hard wood of rolled screws were considerably greater than those of cut ones.

M. PELIGOT, a clever French chemist, claims to have discovered the lost art of producing the beautiful shade of blue which is so conspicuous in many of the ancient ornaments found in Egypt. He analyzed some of the enamel, and then by synthetical experiments has succeeded in ascertaining the proportions of silica, oxide of copper, lime and soda that will produce the marvelous compound.

The End-Play of Car Journals.

To the Editor of the National Car-Builder :

DEAR SIR : The June number of your paper contains a communication from Mr. James G. Thayer, in which exception is taken to certain views in regard to the end-play of journals contained in an article which appeared in your May number under the head of "Defects in the Construction of Cars." As some further information seems to be desired on the subject, I herewith submit a few reasons in support of the opinion advanced by me in the article alluded to.

Sufficient end-play is necessary for journals to prevent them from wearing unevenly or in "rings," and it need not, at the most, exceed ¼ of an inch. More than this is objectionable, especially in the ordinary four-wheeled trucks used under freight-cars, and for the following reasons :

1. It increases the wear of both brass and journal ; and for a journal having a circumference of say 10 inches, and an average end-play of ½ an inch at each revolution of the axle when running, would result in a wear equal to five per cent of the total wear from the rolling or turning friction.

2. It reduces the bearing surface of the brass—small enough at most—thereby increasing the load upon each square inch of its surface in proportion, and thus increasing the tendency to heat, and a still more rapid wear as the result.

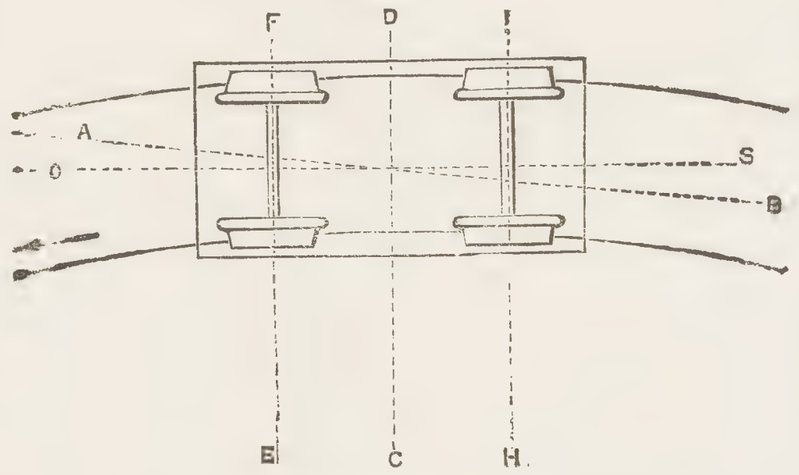
3. When the collars of the journal have reduced the length of the brass by wearing in at each end, the load is then carried by only a portion of the surface of the journal, and such portion, whether it be in the center of the length or at one end, is soon worn to a smaller diameter than that portion upon which the load is carried but a small part of the time ; and then, when the oscillation of the car causes the brass to slide up or rest upon that part of the journal largest in diameter, the surfaces of the brass and journal do not coincide, and the weight at such times is carried on but a small proportion of the surfaces of both, and consequently increased friction, heating, and rapid wear ensue. The greater the end-play of journals, the greater will be their tendency to wear unevenly in diameter at different parts of their length.

4. Ordinarily, about one half the weight resting upon the truck is carried by the side-bearings, which have flat surfaces imperfectly lubricated, and in many cases not lubricated at all ; and the power requisite to cause the truck to adjust itself to its proper position with reference to the track in passing curves, by the sliding of these bearings one upon the other, will vary in proportion to the weight and the condition of the surfaces as to smoothness and lubrication, and may be stated at from twenty-five per cent of the weight on these bearings when dry and at slow speeds, down to almost nothing at high speeds and when in the best condition. In passing a curve, the tendency of the truck-frame is to retain its position with reference to the car-body, the same as before striking the curve, and it is only when the flange of the forward wheel crowding against the outer rail, brings sufficient force upon the truck-frame by the pressure of the collars against the ends of the brasses (or the hub of the wheel against the box), to overcome the friction of these bearing plates, that the truck will adjust itself toward its proper position on the rails of the curve. End-play of journals then proportionally interferes with or prevents the truck from adjusting itself to its correct position with reference to the line of track run upon.

Fig. 1 represents a truck without end-play of the journals when passing a curve, and its position with reference to the center line of the car-body A B and the radial line of the curve, C D. When there is no end-play, the flanges of the wheels coming in contact with the sides of the rails, cause the truck-frame to adjust itself to its proper position with reference to the curve, and, practically, lines passing through the centers of the axle, E F and H I, would be parallel with the radial line of the curve, C D ; and the center line of the truck-frame O S would be at right angles with the radial line C D, in which position the truck would pass the curve with less flange and journal-collar friction, than any other that it would naturally assume.

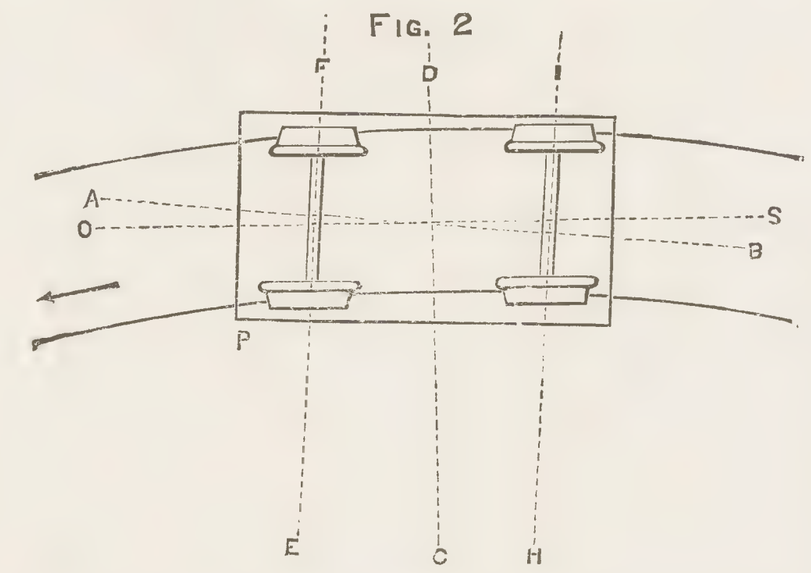
Fig. 2 will serve to illustrate the difference between the position that a truck will assume, where excessive end-play of journals exists, and that where there is practically no end-play. As stated above, the friction of the side-bearings of the truck and the car-body

FIG. 1.



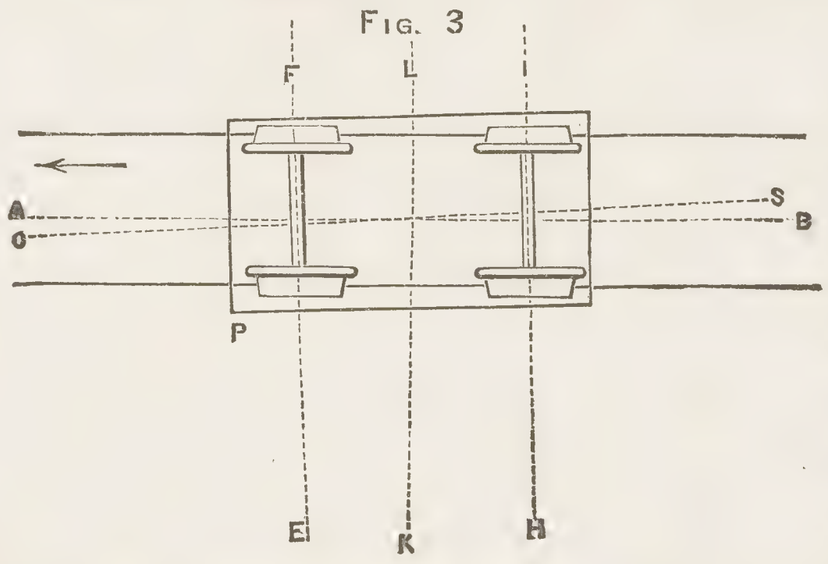
ordinarily prevents a ready adjustment of the truck in conformity to the curves of the track, and it is only after all the end-play is taken up, and the forward pair of wheels have been moved laterally toward P by the curvature of the track, and the collar of the journal has thus been brought against the brass (or hub of the wheel against the box), that the truck frame will move in the direction toward a correct position, relative to the radial line of the curve,

FIG. 2



C D. But owing to the excessive end-play of the forward axle, the forward end of the truck-frame will not have moved far enough toward P, to the extent of *one half the total end-play of that axle ;* consequently the axles will not be parallel with the radial line C D, nor will the center line of the truck O S be at right angles with C D, but will more nearly coincide with the center line of the car-body, A B, and the axles, instead of being parallel with C D, as in Fig. 1,

FIG. 3



will diverge from that line as represented in Fig. 2, proportional to the end-play of the journals ; and to that extent will the flange of the forward wheel tend to run against the rail, *more than when the axles are adjusted as in Fig.* 1, and to that extent increase the rolling friction of the truck.

This applies more particularly to the forward pair of wheels in the forward truck of the car, and at slow or ordinary speeds. The rear truck, when side-bearing friction and end-play are excessive, tends to assume a position the reverse of that represented by the forward truck, in Fig. 2, relative to the radial line of the curve C D, on account of this side-bearing friction. At high speeds, it will be found that trucks adjust themselves much more readily to a proper position on curves, or when passing from curves to a straight line, than they do at slow speeds.

5. The forward truck having assumed its correct position, or approximately so, relative to the curve of the track, will, after passing the curve and going on to a straight line as represented in Fig. 3, tend to run to the side of the track marked P, for the reason that the friction of the side-bearings prevents a free and ready adjustment of the truck to the line of the track, and the center line of the truck O S will not coincide with the center line of the car-body A B, the excessive end-play of the journals permitting the wheels to adjust themselves laterally to their proper position with reference to the center line of the car-body and of the track, *without causing the center line of the truck to coincide with that of the car and of the track* A B ; and as these center lines do not coincide, the lines of the axles E F and H I will not be parallel with a line at right angles to the rails K L ; and to the extent that these lines diverge from that line, will the truck tend to run toward the side of the track marked P, and will continue to run to that side until the lateral surging of the car-body at last produces an adjustment of the truck to its proper position. In the mean time, however, much unnecessary friction and wear of flanges and rails, and absorption of hauling power, is the result of this position of the truck. Where wheels on the same axle are of equal diameter, and when somewhat coned on the tread, the adjustment is much sooner and more easily made than when otherwise ; or, when those on one side of the truck are worn down to a smaller diameter close to the flange than at their outer edge, in which case, with excessive end-play of journals, the center line of the truck and that of the car-body will seldom coincide even while running on straight lines, and to the extent that they do not, the wheels will tend to run to the one side or the other of the track, and thus cause rapid wear, and absorb undue hauling power.

With the oil-box and the proportions of journal and axle in general use, it is not practicable to obtain sufficient collar surface to prevent excessive end-play sooner or later in a majority of cases where the collar surface *alone* is depended upon, and if the collar surface is insufficient, the only things practicable then to be made use of in preventing end-play from becoming injurious, are the hub of the wheel and face of the oil-box. After the collars of the journal have performed their duty in this particular until worn into the brass to the extent permissible, then the hub of the wheel and face of oil-box should prevent further end-play.

The increased rubbing surface thus brought into play under such circumstances can not be a serious objection. Increasing the surface does not increase the friction, as a rule, other things being equal. In this case, however, if the hub and not the collar received *all* the pressure, then this hub friction would occur at an average distance from the center of the axle, of about 3½ inches, but if the pressure was upon the collars of the journals, it would be, in round numbers, 2 inches from the center, and to this extent then so far as that could affect the hauling power when extended to the periphery of the wheel, the friction of the hub would be greater in its effect than collar friction. Taking into account, however, the better adjustment of the truck to the line of the track run upon, when the end-play of journals is confined within narrow limits, it will be

found that, on the whole, less friction occurs under these circumstances than where the collars have worn into the ends of the brass, from having nothing else to assist in relieving the end pressure, until the truck-frame assumes, when disturbing forces are applied to it, such a position as that represented in Fig. 3, and thus cause the flanges of the wheels on the side to which it inclines, to be rapidly worn, and increased wear of the collars into the brasses, and further additions to the already unnecessary end-play.

Ordinarily, smooth castings of wheel-hub and of oil-box need no facing to prepare them for the service required, and when a limited wear of the brass by the collar of the journal must occur before the surfaces of the oil-box and hub touch each other, the matter of facing those surfaces need not be considered.

In connection with this matter of end-play of journals, might be considered the question as to how close it is practicable to bring the center of the journal (center of the length) to that point on the axle directly over the rail. The nearer these two points are to each other, the less the strain upon the axle between the wheels, produced by the load on the journal; therefore, bringing the box as close to the wheel, and even giving the wheel a slight dish on the outside, for the purpose of reducing that distance, is at least desirable. If it were practicable to bring the center of the journal directly over the center of the rail, no strain at all would be brought upon that part of the axle between the hubs of the wheels *from the load carried on the journal.* But as this is impracticable, then the best arrangement theoretically is that which brings these two points nearest each other, and the means suggested for preventing excessive end-play of journals, tend to accomplish that object so far as it is practicable. R. W.

JEFFERSONVILLE, IND., August, 1875.

CENTENNIAL EXCURSION CARS.—The Harrisburgh (Pa.) *Patriot* says, "We learn that the Cumberland Valley Railroad is about having constructed a number of passenger-cars in which seats will be numbered, and overhead there will be a receptacle provided with lock and key for the baggage of the seat-holder. The excursionist buys a ticket, and with it he receives a key and a check attached, and on the check he finds a number stamped corresponding with the number of the seat to which he is entitled. He will find the key to unlock the closet over his seat, but not the closet over any other seat. When he reaches Philadelphia, he can lock up as much of his baggage as he chooses and sally forth. The train will be run upon a siding convenient to the centennial grounds. At any time the excursionist desires he can walk over to the train, unlock his closet, and take out or put in any thing he chooses. He may even put his lunch there. At night, on the way home, the check and key are taken up with the return ticket. The passenger is thus put at no inconvenience; but, on the other hand, is supplied with accommodation almost unknown to railway travelers at the present time."

THE New York and Long Branch Railroad is now in full operation affording facilities for rapid and certain communication between the commercial metropolis and its nearest and most popular sea-side resort. The new route connects with the New Jersey Central at Elizabeth, is operated by the officers of that road, and in consequence, has all the advantages of the superior terminal facilities of that extensive and excellently managed corporation, while the same connection gives it an equipment of the highest order.

THE Ninth Annual Report of the Master Car-Builders' Association is now ready for distribution.

SEE advertisement of Loughridge Air-Brake, page 140.

A NUMBER of first class passenger-cars are in process of construction at the works of the New-Haven Car-Company.

The National Car-Builder

PUBLISHED MONTHLY,
BY
VOSE, DINSMORE & CO.,
32 WARREN STREET, NEW-YORK; 194 LAKE STREET, CHICAGO; 720 NORTH SECOND STREET, ST. LOUIS.

JAMES GILLET, EDITOR.

Terms, $1.10 per Annum.

SEPTEMBER, 1875.

Editorial Announcements.

CORRESPONDENCE.—*We cordially invite the co-operation of the railroad public in affording us the material for a good mechanical paper. Articles relating to rolling-stock and machinery, by those practically acquainted with those subjects, will be gratefully received. All communications must be addressed to Vose, Dinsmore & Co., No.* 32 *Warren Street.*

ADVERTISING RATES.—*For one square, or one fifth of a column,* $5 *per month, or* $50 *a year. For half a square,* $3 *per month, or* $25 *a year. Larger advertisements by special contract.*

All communications in regard to advertising should be addressed to L. F. DINSMORE, *Post-Office Box* 4055, *New-York City, who is our agent for advertising, and authorized to make contracts, collections, etc.*

ENGRAVINGS AND ILLUSTRATIONS.

We would invite the attention of Master Car-Builders and others to the advantages to be derived from publishing in THE NATIONAL CAR-BUILDER *engravings designed to illustrate the various features and details of car construction, and especially such improvements as can not otherwise be clearly presented. We will procure cuts to be made in the best manner from drawings or models that may be sent us, and charge only for the cost of engraving, inserting the same in our paper with suitable descriptive details, without charge.*

The Outlook for Railway Manufactures.

IT is a prevailing impression that a restoration of our manufacturing industries to their former activity is dependent to a very great extent on the construction of new roads. The collapse of those industries which followed as an immediate effect of the stoppage of such construction, would seem to confirm this impression, but the conclusion is not altogether warranted by a careful survey of all the facts of the case. The construction of 25,000 additional miles of railroad during the brief period of four years previous to 1873, was the result of a morbid activity, and the reaction which followed was natural and inevitable. The government had been an enormous consumer of the products of industry during the war. A delusive prosperity prevailed in all kinds of business; every body seemed to be on the high road to wealth, and war appeared in the guise of a blessing instead of a curse. Railroads shared in the general prosperity, and at the close of the war they became in their turn every body's customers. The share market was booming, and dividends and surplus earnings attracted unemployed capital from all directions for the construction of new roads. The great iron interest was directly stimulated, and the artificial buoyancy was from thence imparted to all the ramifications of trade. The earnings of the roads, however, could not be kept up to the war standard; the Granger movement supervened, followed by hostile legislation, and the revulsion soon revealed the real situation. The craze had reached its climax; the bubble exploded, and the reaction paralyzed the business of the country.

We are now slowly recovering in spite of the distrust engendered by a vicious currency. Railroads are so identified with all our business activities that the expenditures necessary for their construction and maintenance will always be a controlling element in our industrial progress. As regards new construction, it is safe to assume that it will not be very great for some years to come; and that any general revival of business will be due to other and more legitimate causes. Of the 72,000 miles already constructed, 69,000 were in actual operation at the close of 1874. These roads will receive the benefit of whatever increase in traffic takes place, and become more productive year after year. Their capacities will be taxed more and more, and this will render necessary a corresponding increase of repairs and renewals of every description. The products of our iron and steel manufacture, instead of being employed as heretofore so largely in the construction and equipment of new roads, will be needed to maintain and increase the capacities of those already built; and the demand will be a continuous and growing one. The aggregate mileage is enormous, and to keep the productive portion of it in good condition will necessitate an annual outlay, equal to at least ten per cent of the original cost of the roads. This will include new machinery, rails, bridges, stations, side-tracks, etc. It has been estimated that the existing roads in Ohio, Indiana, and Kentucky will require an annual expenditure of $45,000,000 to keep them in good condition, and this estimate may be taken as a criterion for other States and sections.

So it would seem that the mere stoppage of the construction of new roads is not a calamity of such magnitude as to keep our foundries, rolling-mills, and machine-shops forever idle. If not another new road was made for ten years, the wants of those already in operation ought to keep these branches of industry in a fair state of activity. But new roads will continue to be built, although never in the same ratio as they have been; and we see no reason why railroad manufactures should not show a gradual but steady recuperation until the point of full recovery is reached, or at least such a recovery as the legitimate requirements of our railway system and the trade of the country will warrant.

What is a Dollar?

IN our monetary demoralization we have drifted so far away from the old landmarks that we are in danger of forgetting what an old-fashioned dollar really is. This is notably true of the rising generation. Every youth of seventeen or thereabouts, remembers nothing, and has no practical knowledge of, a mixed currency of coin and paper of uniform and equivalent value. A dollar is to him a vague, uncertain, artificial, shadowy ghost of a thing, embodied in little bits of paper, embellished with fanciful lettering and figures. To those of riper years it is a cherished tradition of the past, existing in a kind of post-mortem, unstable, fluctuating way, the specter of things hoped for, and the caricature of things not seen. The name is in every body's mouth, and figures in all trade and traffic—a kind of hollow conventionality, as it were, adhered to for the sake of form, and as a melancholy reminder of the vanished substance.

There is no more inviting field for the successful display of demagogue sophistry than the so-called currency question. Upon no other subject can the mind of the average citizen, who adopts his views at second-hand, be more hopelessly obfuscated and bewildered. The problem, as a whole, is so complicated and presents so many deceptive appearances, that there is danger of being misled unless certain fundamental principles are kept constantly in view.

The real dollar is not an imaginary thing. It is the product of the mine and the mint, and is made of gold. As respects value, this original dollar is not a sign, but the thing signified; not a representative, but a constituent; not the thing measured, but the measure; and all other dollars, good, bad, and indifferent, are gauged by it and sustain a fixed relation to it. A

counterfeit, necessarily implies a genuine, just as a glove implies a hand. The minted coin may be adulterated with alloy, or made larger or smaller, so as to weigh less or more; but the rare, desirable, and intrinsically valuable metal it contains, determines its quality. The inherent nature of gold makes it necessarily a measure and standard to which the value of all other commodities is made to conform. Its function in this respect can not be destroyed. It has an intrinsic worth of its own which would not be impaired a whit if a coined or paper dollar had never been heard of. This being its nature and function, its relation to a paper currency can no more be destroyed than the relation which exists between the rotation of the earth and our ideas of time. Build as inflated a structure of artificial values as you please, the foundation remains the same, and the relation of the structure to its foundation will infallibly be the test of its stability.

Now, very many people have got it into their heads that there is no necessary relation between gold and silver and a sound paper currency. They talk of specie payments as an old fogy notion which the world has outgrown, just as it had previously outgrown the primitive ideas of barter. All that is necessary, they say, to make paper money as good as gold, is *faith*, irrespective of any definite time, place, or mode of redemption. They would make the validity of money depend upon the consent or agreement of people to take it, instead of making it good and valid independently of such consent; or good intrinsically, whether people have faith in it or not. They repudiate the idea of coin as a basis unless there is as much of it lying idle as there is paper afloat, forgetting that every dollar of coin circulating at par with paper, is at the same time a basis, because the two could not circulate together or at par unless the volume of paper was limited by its relation to coin; and this relation could not exist unless coin was a basis into which the paper is convertible at the pleasure of the holder. All transcendental theories to the contrary, there never has been and never will be a currency worthy of the name, that does not represent bona fide, existing, available *property*, in transit, in store, fixed or otherwise, at a valuation of which the gold dollar is the index and measure; and aside from this available security, a reserve or margin more or less of gold or silver coin for constant redemption. We may not have such a currency for many years to come, but if we ever *are* to have it, we must set our faces toward it and not in the opposite direction.

Rapid Transit.

It almost seems as if this familar term, in its local application to the city of New-York, was in some danger of becoming a by-word before the thing itself is fully realized. That we shall some day be relieved from the discomforts of horse-cars, is quite probable, but like the predicted millennium, the event is just now rather dim, distant and uncertain. In saying this much we do not ignore the fact that the New-York Elevated Railway, now in successful operation, has already enabled us to realize in a small way the advantages of rapid transit. It is a prophecy and sign of greater things; and while it is in one sense a relief, it is none the less in another sense an aggravation, by reminding us of what might be but is not.

The subject has certainly been discussed long enough to enable engineers to mature plans that are practicable, and from which a safe one could be selected. Until this point is reached, all is chaos. The commissioners appointed under the recent law are now considering the plans submitted, of which there are a hundred, more or less. One or more of these may be adopted, or they may all be rejected. The promoters of the various schemes represent, of course, so many opposing interests, each struggling for the coveted prize of acceptance; and under these circumstances it is safe to assume that the progress made will not be very rapid. Could the matter be decided upon its intrinsic merits, regardless of outside pressure and influence, we think rapid transit would soon take on a visible and tangible form and be pushed to completion. It is a big job, involving fat contracts and grave responsibilities, and the discussion may be prolonged a year or two more before the work is actually begun. That it can be deferred forever we do not believe.

English and American Railway Coaches.

Trouble occurs every now and then upon English first-class railway carriages where two persons of opposite sexes happen to be thrown together in a compartment of which they are the only occupants. Whether this is due to a lax morality among the privileged and wealthier classes who journey by rail, or to the narrowness and exclusiveness of the space occupied, is perhaps an open question. We are inclined to think, however, that ladies upon English railway trains would be safer from insult, and men less liable to be arraigned upon false charges, if there was a trifle less of isolation in the car compartments, or if the sexes were placed in separate coaches. Under the present system, it is no unusual thing for them to be shut up together in pairs, an arrangement that would lead to untoward results almost anywhere, even in communities of the most Platonic pattern. In the case of our cousins over the water, the trouble could doubtless be obviated to a very great extent by bringing the occupants of cars more together, and by providing a communication from one car to another at all times, and especially when the train is in motion. The remedy, it is true, might be considered as bad almost as the disease; for whatever tends to break down the barriers of exclusiveness in English society is repugnant to the national traditions. The idea of thirty or forty persons, or even half the number, occupying a common undivided space together, even for a few hours, would be an innovation dangerous to the stability of Magna Charta. To save society from utter dislocation, class distinction must be maintained as rigidly upon railway cars as anywhere else. Such a distinction, it is true, exists in a modified form on our own roads. We have our palace-cars, our ordinary day-cars, and our emigrant cars; but even upon the most palatial and exclusive of the first-named class, it would be next to impossible for a lady to receive uncivil treatment, much less to be made the subject of an assault like that for which Col. Baker has recently been convicted in an English court. The truth is, that the English people, with all their enterprise and skill in railway development, have not yet entirely emancipated themselves from the old hackney-coach system of traveling. The form, at least, is still retained in the style of their better class of railway cars—or more properly, coaches—and so inveterate is their attachment to old methods, that it is questionable whether the presence of our Pullman cars on one of their leading lines will bring about any speedy change in the style of the passenger equipment of the other lines.

The two systems have no doubt their special advantages in many respects. Our style of cars affords greater freedom of action and opportunity for mutual intercourse, and of course greater personal security; while theirs makes it more difficult for one passenger to annoy others by opening windows; the facilities of ingress and egress are somewhat better, and the couplings being more secure, causes greater steadiness at high speeds, with less danger of telescoping in case of accident. Whatever may be the peculiar advantages, however, of the English system, it is far more likely to be modified little by little so as to conform to ours in the capacity and style of passenger-cars, than ours is to gravitate towards theirs in any leading feature. In the mean time it is to be hoped that our first-class cousins who ride in first-class coaches, will make the best of their system while it lasts, and not bring reproach upon it by any more improper behavior.

Settlements for Cars Destroyed.

The interchange of cars by the various roads throughout the country, makes it necessary to determine the value of such as happen to be destroyed upon roads to which they do not belong. An attempt has been made to apply a specific rule in such cases, by means of which the value may be ascertained upon the basis of original cost and an annual percentage of depreciation. This method, however, has not proved very satisfactory, for the reason that cases often occur that can not be equitably adjusted in such a way. The rule assumes that the cost of a car is subject to no variation as respects the material and labor employed in its construction, and that its depreciation from wear and tear is uniform. This, as every one knows, is not so. A good many more so-called dollars were required to build a freight car of a given size and quality, five years ago, than are required now for the same purpose; and some cars of the same class and style of construction, get as badly worn and battered in three years of service as others do in five or six. It is easy to see that under such a rule, a very erroneous estimate may be made as to the value of a car in a given case, and differing very widely from its actual value. We doubt whether any rigid and arbitrary rule can properly apply where the conditions of the cases are so variable. The point is, to determine the value at the time the car is destroyed, irrespective of its original cost, or what it would cost to build a new one. The owner is entitled to have the damage made good, and such damage can only be ascertained by a fair appraisement, in which the cost of the car, its age and service, condition when broken up, the present cost of a new one, value of the scrap and other materials of the wreck, etc., should, as far as practicable, be taken into account. Such an appraisement, made by two intelligent car-builders of the respective roads, would not be far from what is just and right; if they differed, the difference would be so small that neither party would suffer by dividing it.

There are cases, however, where cars are burned, or so completely demolished that an inspection of the remains would afford no very correct indication of their previous quality. In order to determine their value, the representations of the owners as to their condition, must to a great extent be relied upon. The golden rule is the only one that applies, and this forbids any advantage to be taken of an accident to effect a desirable sale of the article destroyed. Some roads keep such a record of cars and car service that the condition of any individual car can at any time be ascertained from such record; but this is next to impracticable upon lines with a heavy equipment. A car may be completely destroyed, in many cases, where its condition is not a matter of record, and consequently can only be conjectured or guessed at. It may have been several years in service, and been subjected to exceptional hard usage, or it may have been partially or almost entirely reconstructed, like a jack-knife with a new blade or handle. If there is no record of such repairs, and no way of identifying the car; and its value is determined under the rule of percentage and original cost, the owners would be likely to suffer a loss which would be in effect a penalty for not keeping such a record.

There would seem then to be little difficulty in making settlements in a just and satisfactory way where the condition of cars is known; but when their condition is a matter of uncertainty, it is obvious that no rule can be framed that will entirely meet the case, and settlements in such cases must be made by such mutual agreement as the probabilities and circumstances seem to warrant. The car-builders at their recent convention discussed this subject just enough to disclose its inherent difficulties, but failed to reach any definite conclusions.

The Master Car-Painters will meet at the Grand Central Hotel, in this city, on Wednesday, Sept. 8.

Sound Castings.

To obtain good and sound castings, in all cases, and under all circumstances, is the chief engrossing care of all founders. There are, of course, many established rules and forms of procedure gathered from the experience of many years, that generally serve the founder to a sufficient extent to obtain good castings, as a rule, and to make "wasters" the exception.

If thoroughly practical men were to add a precise knowledge of what may be supposed to be taking place in and out of the mould, the proportion of bad castings would be much reduced. It is not only the castings which—broken or blown in the moulds—can not possibly be used, that ought to be included under the head of unsound castings. There are, throughout the whole range of castings, delivered apparently sound and complete from the foundry, a considerable portion in which it is only a question of time as to how long they will hold together. It is notorious that the greater proportion of break-downs in fly-wheels, castings in motion, or castings under pressure, are occasioned by some inherent defect or liability to break in the casting itself, since the broken section is frequently of much more than the requisite area to resist any possible strain that can have occurred. These are the unsound castings of which we would warn both purchasers and producers.

As to the unsoundness of castings produced by blow-holes or scum, this is usually patent to the eye of the founder, at least, though not always to that of the customer, after being puttied up, and can be tested by the blows of a small hammer upon any surface whose soundness may be suspected.

The tendency to form blow-holes is well understood among founders, and may be caused in two ways: either by the imprisonment of the air originally contained in the mould, or by the generation of steam or gases from the sides of the mould and core. It is surprising how little power of reasoning from cause to effect there is as a rule among practical men, to whom both the cause and the effect may be perfectly plain and patent.

Given a case where a casting is produced covered in places with blow-holes, the causes of the effects may be accurately defined. In the first place, these blow-holes are produced by the presence of a gaseous body displacing the metal. There are then two possibilities—either this gas is the legitimate air which has not been allowed to escape, or it is a further accumulation of steam or gas generated from the mould; neither of these possibilities should have existed. In the first place, any possible air-pocket in the mould should be thoroughly ventilated by an escape air-hole, and whilst the metal is being poured at one runner, the air should be allowed to escape elsewhere. In the second place, the mould and cores should be so thoroughly dry as to prevent the formation of steam; and further, their composition should be so carefully selected as to preclude the employment of materials liable to burn or to generate much gas. The ventilation from the cores should be especially looked to, as they are generally found to become damp after running the metal, even when thoroughly dried. In the case of large castings a great deal depends on the open and porous nature of the mould-bed.

If, then, the following points are always rigidly looked to, there should be little fear at any time of a porous or air-blown casting. 1. That whilst the metal is being poured at any runner, there should be free egress for the imprisoned air through another exit. 2. That all pockets or high portions of the mould should have a separate additional air escape. 3. That the mould and core be thoroughly dry, to prevent the evolution of steam as much as possible. 4. That the materials forming the mold and core should be already burnt, so as not to give off gases with readiness on contact with the molten metal. 5. That where the casting is long and has a double surface, one above the other, an infinitely better casting may more readily be obtained by casting the same with its length considerably inclined from the horizontal, and pour on to the lower face first, or placed vertically and run with a head. A very frequent cause of the generation of an excessive quantity of gas in a mould is the mixture of too much coal-dust and slack in the mould, and using the sand too wet for facility in moulding.—*Iron.*

High Grades in Switzerland.

A ROAD recently opened up Mount Uetliberg, Switzerland, overlooks, at a height of 1,300 feet, Lake Zurich. The total length is 5½ miles. The lowest grade is 232 feet per mile, but 59 per cent of the whole exceeding 264 feet per mile. The curves are 500 and 450 feet radius, the latter coinciding with a grade of 327 feet. The track is standard gauge, and the rails, of iron, weigh 60 lbs. There are three tank locomotives of the Krauss pattern, with six drivers coupled, each 38 inches diameter, and with a wheel base of only 6 feet 8 inches. They weigh 41,800 lbs. empty, and in service from 52,800 to 55,000 lbs. The heating surface is 770 square feet, diameter of piston 12½ inches, stroke 21½ inches. At the first ascent, the engine pushed up three cars with gross load of 30 tons, at from 8 to 10½ miles per hour, with steam pressure of 170 lbs. The descent is made with compressed air, by means of an apparatus used on the engines of the Rigi road; speed, 15½ to 18½ miles per hour. At other trials the weight hauled was 627½ tons, traction about 7,500 lbs., and the work 200 net horse power.

Another Swiss mountain road, the Rigi Kulm and Lake of Zug, is 7 miles long; 6 miles are worked with a peculiar cogged wheel arrangement, by which grades of 1056 feet per mile are surmounted; radii of the curves, which are uniform, 600 feet.

Poor's Railroad Manual.

THE volume for 1875–6 is like its predecessors in its general appearance, and in the character and arrangement of its contents. That portion of it which is occupied with statements of the operations and financial condition of the individual roads in the United States and Canada, contains twenty-four pages more than last year's volume, and there is also the usual summary in tabular form, of the debt, resources, and general condition of all the roads in the United States.

The total construction at the close of 1874 was 72,623 miles, being an increase of 1940 miles over the total construction reported at the close of 1873, such increase being distributed as follows: New-England States, 195 miles; Middle States, 272 miles; Western, 1078 miles; Southern, 249 miles; and Pacific, 146 miles.

The total mileage of the roads whose operations are reported in 1874 was 69,273, as against 66,237 miles reported in 1873, the increase being 314 miles for New-England, 433 for the Middle, 2666 for the Western, and 27 for the Pacific States. The Southern States show a decrease of 403 miles. The average cost per mile, on the basis of capital stock and funded and floating debt, is $60,425.

The aggregate earnings of all the roads are represented as follows:

Gross earnings of passenger traffic	$140,999,081
Gross earnings of freight traffic	379,466,935
	$520,466,016
Operating expenses	330,895,058
Net earnings	$189,570,958

This exhibit, as compared with 1873, shows the following results:

Falling off in gross earnings	$5,953,919
Increase in net earnings	5,760,396
Falling off in freight earnings	9,568,573
Increase in passenger earnings	3,614,654

The gain in net earnings is due to a reduction of $11,714,315 in operating expenses, brought about by a decline in the prices of labor and material, and also by a more economical management in all branches of the service. The gross earnings, however, while they show a falling off, as compared with those of 1873, of $5,953,919, are at the same time $55,224,961 more than those of 1872, and $117,136,808 in excess of those of 1871.

This, in view of the depressed condition of trade and the diminished movement of products and merchandise, which will make the year 1874 a memorable one, is not by any means an unfavorable result. It shows that the resources, industrial capacities, and real wealth of the country have not been impaired, and that our railroads have a relation with these elements which is fixed and permanent. The proportion of net earnings to gross will doubtless continue to increase, for the reason that lower prices and close economy are likely to prevail in railway expenditure for some years to come. The tonnage of 1874 was very nearly or fully equal to that of 1873, and there will doubtless be no falling off during the present year.

The returns of rolling-stock, as given in the Manual, are necessarily imperfect, and can only be considered as an approximation toward accuracy. The footings of the tabulated statement are as follows: Locomotive engines, 14,862; passenger-train cars, including baggage, mail, postal and express, 13,055; freight-cars of all kinds, 358,101, making a total of 371,156 cars on United States roads.

The volume also contains a list of street railroads in Massachusetts, New-York, and Pennsylvania, with details of their operations; also statistics of the New-York State canals; a statement of land-grants to railroads, and also of National and State debts and liabilities.

THE FISHER REFRIGERATOR. — The *Scientific American* acknowledges the receipt of a very finely constructed refrigerator from the inventor, Mr. J. Hyde Fisher, of Chicago. It is covered by three patents. One applies to the principle of separating the cold and warm air, keeping the latter at the top of the cooling-room. This is done by the cold air from the ice-chamber entering the cooling-room at a point below that at which the warm air escapes. There is a constant circulation so long as any ice remains. The other patented additions are a very ingenious latch for the doors, and a tap-hole protector, which is so constructed that, when the door is closed, no cold air can escape from the refrigerator around the faucet. Meats, vegetables, and fruit have been kept in the cooling-chamber for several months at a time in perfectly sweet condition. The preserving properties of the invention have been put to a very severe test in its application to refrigerator-cars, of which several, constructed on the principle described by Mr. Fisher, have for some time past been used as a means of transporting Western fruit, etc., to Eastern markets. For fish-dealers who freeze a large stock of fish, the system has proved itself eminently suitable, since it has already been successfully adopted in the construction of several large cooling-houses in Western cities. These last-mentioned receptacles have been, and we are informed will in future be, built under the direct supervision of the inventor. The manufacturer of portable refrigerators and boxes is Mr. H. C. Van Schaack, Jr., of 991 Michigan avenue, Chicago, Ill., who may be addressed there for further information.

THE iron bridge across the Mississippi river at Atchison, Kansas, has been fully tested. Five engines and tanks, with an aggregate weight of two hundred and fifty tons, were used in the test, and under this trial there was a deflection of but 1⅝ inches, displaying great solidity and firmness. Master-mechanic Williams, of the Atchison and Nebraska Railroad, ran the first engine across the bridge, carrying the bridge officers, press reporters, and prominent citizens. The bridge is now open for business. The Kansas City, St. Joseph and Council Bluffs, Chicago, Rock Island and Pacific, and Hannibal and St. Joseph roads will run both freight and passenger cars across. From thirty to thirty-five trains will cross the bridge daily.

A GLASGOW paper gives an account of a new street-car propelled by compressed air, which has successfully passed a public test in that city. The atmospheric air is pumped into six tanks underneath an ordinary street-car, and is made to act on two engines also under the car. The floor of the car is about the same height from the ground as the floor of an omnibus. The tanks are to be filled from receivers stationed at convenient distances along the routes, the time occupied in filling them being only two minutes. At the trial of the car it ran about 1400 yards, at a maximum speed of twelve miles an hour. No mention is made of the load, if any, put upon the car.

IT is said that the Colorado Central Railroad, which is twenty-one miles in length, is built among the rocks and ledges, and is known to be the crookedest line ever built. At but three places is the track straight, and then only for a distance of three hundred feet. It is, moreover, said that the legislature granted the company a charter as a joke, never expecting that it would be built, yet it has proved a profitable investment to the builders.

AN engine has recently been placed on the Pennsylvania Railroad which weighs seven tons more than the ponderous Modoc, whose drawing capacity is almost twice that of an ordinary locomotive. The Modoc is capable of taking eighty loaded cars from Harrisburg to Columbia, while other engines are put to a severe test when they pull fifty cars on that portion of the road. This locomotive, when fully initiated, is expected to get away with a hundred cars. The only argument that can be used against large engines is that they are hard on tracks, but as the Pennsylvania Railroad Company has adopted steel rails the wear will not be material.

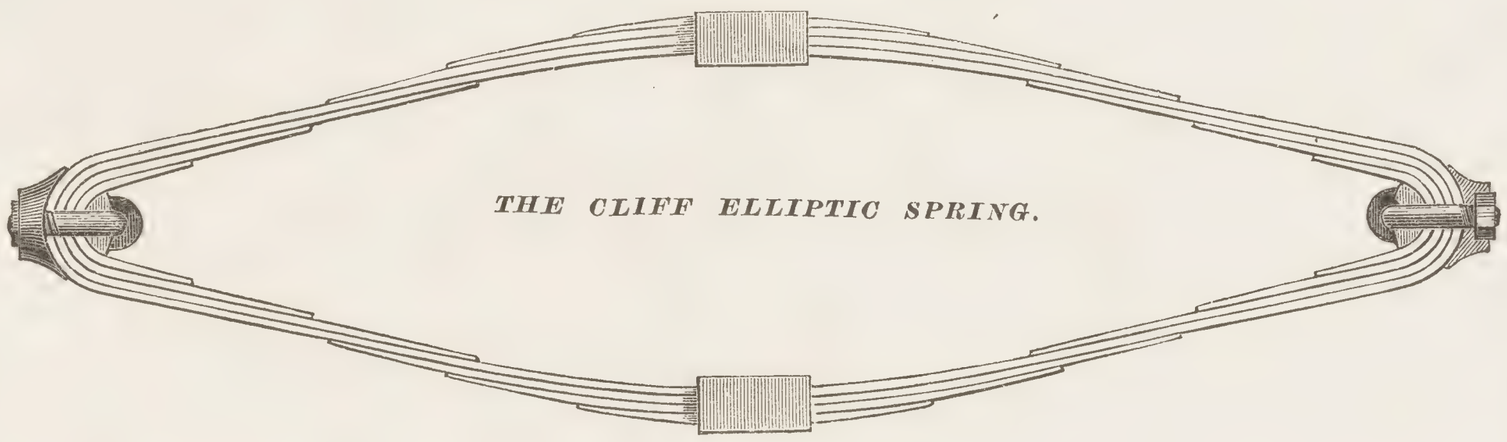
THE Litchfield Car Manufacturing Company, of Litchfield, Ill., have contracted for 100 freight cars for the Galveston, Henderson and San Antonio R. R., and 50 coal cars for the Kansas City, St. Joseph and Council Bluffs R. R. The works have other smaller contracts also in hand for coaches, etc., for narrow-gauge roads. Their capacity is from 8 to 10 freight cars per day, and 4 to 8 passenger train cars per month. The company also manufacture stationary and portable engines, steam boilers, machinery, car wheels and railway castings, and have the reputation of doing first-class work. The officers are practical and experienced railroad men.

New Publications.

Official Time Tables.—The National Railway Publication Co., of Philadelphia, is now publishing each month a small railway guide with the above title, and designed for the use of travelers who do not desire all the detailed information contained in the *Traveler's Official Guide.* The new work is more portable, contains only such towns as have over 500 inhabitants; telegraph stations are indicated, and also the junction points, and the arrangement is such that a morning train can not be mistaken for an afternoon one. There is also a page showing the through trains leaving the principal Eastern cities for the West, and vice versa. Following the schedules is a list of towns and cities of over 4000 population, giving their location, railroads and other particulars. The volume also contains a very handsome general railway map, and also smaller ones, with other valuable information. Price 25 cents.

Hand-Book of Land and Marine Engines, by Stephen Roper, Engineer, and author of several valuable works on steam mechanism. The present volume contains 600 pages, and is very compactly and handsomely bound, and will prove extremely useful to operatives and others who desire a clear, intelligible and practical treatise on the modeling, construction, running and management of land and marine engines and boilers. The work contains numerous illustrations, a number of valuable tables, and a full and well-arranged index. The reputation of the author as a competent and trust-worthy authority on steam engineering will doubtless insure for this publication an extensive and ready sale. Price $3.50.

The Penn Monthly—The August number of this very ably conducted periodical is fully equal to the previous ones, and contains several articles that will be appreciated by readers of thought and cultivation. One of these discusses the theory of the discovery of America by the Chinese at some remote period of antiquity. There are others on Educational Reform and the Fossil Flora of North America.



THE CLIFF ELLIPTIC SPRING.

A NUMBER of improvements of more or less importance have been made in the construction of this spring since its first introduction to the market. One of these is shown in the cut, and consists in giving a larger curve to the ends, instead of adhering to the V shape as they were at first made. The arch of the spring is thus virtually lowered and brought nearer to a horizontal line, the effect of which is an easier action and greater elasticity. The clamps are also curved so as to fit perfectly the curves of the plates, and all are held in contact by the bolts, the nuts fitting into a recess in the outer clamp as shown on the right of the drawing. By this improvement the working capacity and strength of the spring are increased, and it is rendered as nearly perfect as possible. The several parts are now made by machinery, which secures a more perfect fitting of the plates than can be obtained by means of hand-labor.

THE Pennsylvania Railroad Company has determined that hereafter premiums shall be paid to engineers and firemen on all lines operated by it according to certain specifications. Monthly premiums to engineers and firemen showing best results for preceding month will be $20 and $10 respectively; annual premiums showing best average results for preceding year will be $100 and $50 respectively for first premium, and $75 and $37.50 respectively for second premium. No engineer or fireman violating rules or neglecting duty will be entitled to premium for the month in which such misconduct occurs. In such cases the premium will be paid to the man showing the next best results.

THE Waynesburg and Washington narrow-gauge road is making progress, and will be ready for its rolling-stock before spring. It penetrates a region lying between the Ohio and Monongahela Rivers, hitherto unsupplied with railway facilities. The road will be 28 miles in length, and its estimated cost is about $6000 per mile. The grading costs $1000 a mile; and it may easily be ascertained what the rails will cost. They will be 32 lbs. to the yard—including both rails, 64 lb. to the yard, equivalent to 56.32 net tons per mile, costing, at say $50 per ton, $2816, which added to $1000, for grading, aggregates $3816; showing a balance of $2184 for ties, track-laying, &c.

Facetiæ.

"MARIA," observed Mr. Holcomb, as he was putting on his clothes one morning, "there ain't no patch on them breeches yet." "I can't fix it now no way; I'm too busy." "Well, give me the patch then, an' I'll carry it around with me," added Holcomb. "I don't want people to think I can't afford the cloth."

SHE tried to sit down in a street car, but was pinned back so tight she couldn't. Old lady peeped over her specs and asked her, "How long have you been afflicted that way?" The young lady blushed and made "a break," sitting down sideways, and holding her knees together so tight that she looked as if she had on a one-legged pair of breeches. Old lady noticed her sitting in this sideways cramped position, and whispered, "Bile, I s'pose; I have had 'em thar myself."

"WELL, Mr. Miller," said a Yankee, proudly, to a traveling Scot, as they stood by the Falls of Niagara, "is it not wonderful? In your country you never saw any thing like that." "Like that!" said the Scot; "there's a far mair wonderfu' concern no twa miles fra whar I was born." "Indeed!" exclaimed Jonathan, with an air of supercilious skepticism; "and pray what kind of concern may it be?" "Weel, mon," replied Sawney, "it's a peacock with a wooden leg."

A CHEMIST says tears are simply "phosphate of lime, chlorite of sodium, and water." Now that the thing is understood, if a man's mother-in-law dies, he can go to a drug-store and get all the tears necessary for the occasion for about ten cents.

A SOFT-HEADED youth residing in Sangamon County, Ill., has gone melancholy mad for love of Bessie Turner, brought on by reading her evidence in the Beecher trial. One night recently he made a clumsy figure of his bed-clothing, and carried it from room to room for several hours. Finally he kicked it down two flights of stairs and into the cellar, yelling as he stood at the door of the latter apartment, "Why, Bessie, you tumbled down! Didn't you?"

FLIES cause one fifth of all the profanity in this world. This is the opinion of a bald-headed man.

A MINNESOTA man who wanted to see how bees worked in the hive, can manage to squeeze a number-twelve hat on his head now.

A RUSTIC couple, newly married, marched into a drug-store and called for soda-water. The obliging clerk inquired what syrup they would have in it when the swain, deliberately leaning over the counter, replied, "Stranger, money is no object to me; put sugar in it."

A MECHANICAL genius in New-Orleans has invented a contrivance consisting of a neat little skeleton attachment for the roof of a street-car, with the hinge just over the door. It is rather ornamental than otherwise, and does not in the least interfere with passengers. The driver works it by a sort of treadle. When he sees a boy catching on the step, he will go through the usual forms. He will look indignant and threaten the boy, and appear to be awfully riled; and of course the boy will grin and stand on one leg, and waggle his finger against his nose in derision. Just at this interesting crisis the driver will stamp his feet with vigor, and a thing like a grappling-hook will suddenly fly down and wrench out the seat of that boy's trowsers, and snatch him several feet to the rear of the car, where the inevitable milk-cart will run over him.

NEEDHAM'S
Safety Signal Light,
FOR
PREVENTING REAR COLLISIONS.

Shows in both directions whether the train is moving fast, or slow, or stopped.

In cases of trains uncoupling it is superior to the *"Block System,"* and for safety to trains following, it is the *Best Light in Use,* indicating by the simplest mechanism, both speed and distance.

CARS EQUIPPED FOR TRIAL FREE.

ADDRESS,

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Adopted and in daily use on all the passenger rolling stock of the Baltimore and Ohio, Connellsville and Pittsburg, Marietta and Cincinnati, Sandusky and Newark, Central Ohio, W. P. and S., Orange and Alexandria, Western Maryland, Cumberland and Pennsylvania (with 182 feet of zigzag grades to the mile), and others. The cheapest in equipment and repair, and the most effective brake in the world for general purposes. Better results guaranteed in every-day use than were accomplished in the recent great competitive trial of brakes in England.

I challenge all owners of competing brakes to meet me on public trial, at the great Centennial, in 1876. Rights low, as I am sole owner of my patents.

Refer to any one of the executive officers, master-mechanics, conductors, or engineers on the above roads.

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SAW, FLOUR AND GRIST MILLS.
MILL GEARING MADE
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Maker and Patentee of

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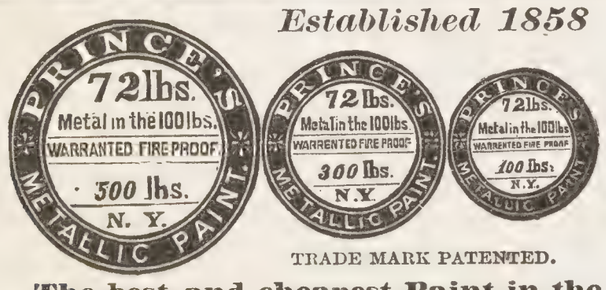
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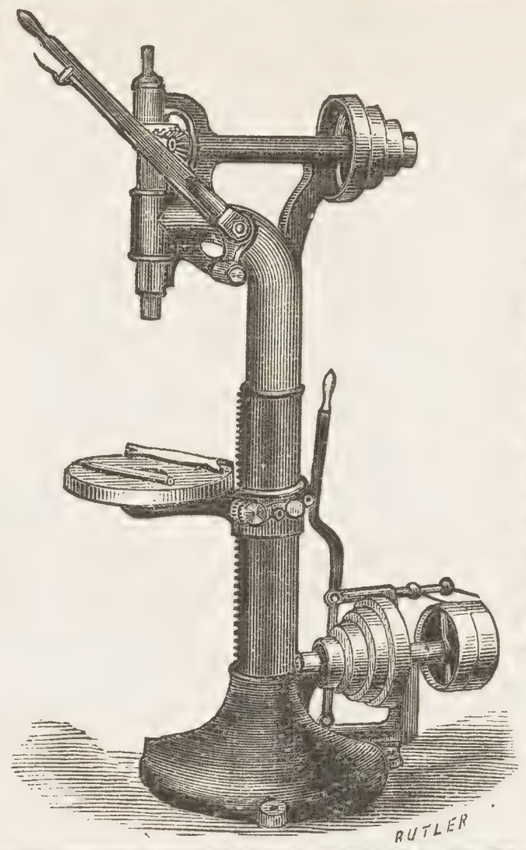
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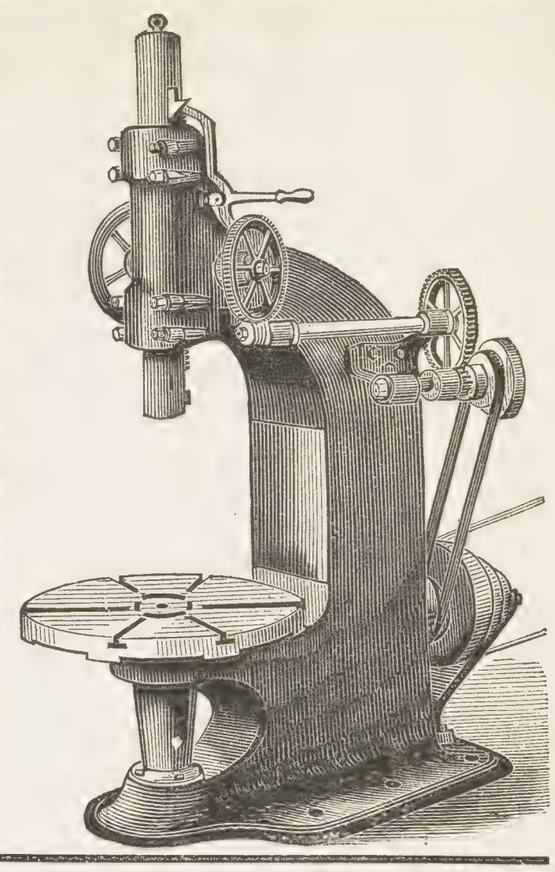


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ROOFS Improved Plastic Slate

will repair and preserve old roofs of shingles, tin, cement, or of any kind, cheaper and more substantially than any thing else in use. It has been tested and improved upon for ten years, and is a perfect protection against *weather* and *fire*, and is indorsed by EIGHTY-TWO FIRE INSURANCE COMPANIES. Reference is made to over 2000 ROOFS in New-York—on CHURCHES, BROWN STONE DWELLINGS, FACTORIES, etc. It is equally good for *steep* or *flat* roofs, and is easily applied on old or new buildings.

PRICES OF MATERIALS READY FOR USE.

For an entirely new roof, 5 cents per square foot. Old shingle roofs can be coated and made tight and fire-proof for 1½ cents per square foot. Tin roofs for ½ cent per square foot. Gravel roofs for 1½ cents per square foot. Felt and cement roofs for 1 cent per square foot.

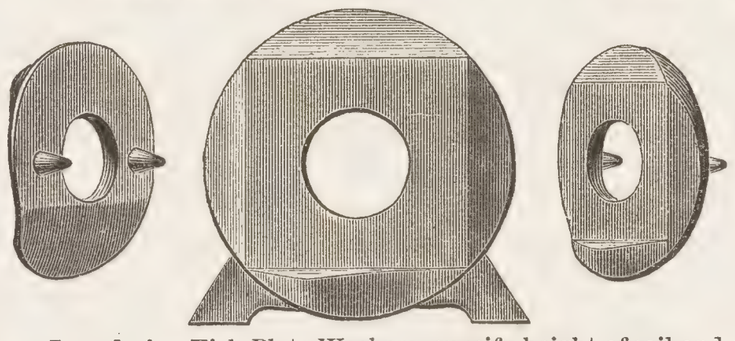
Plastic Slate Paint, 60 cents per gallon.

Plastic Slate Roof Coating, thick, 60 cents per gallon.
Plastic Slate Cement, for pointing up chimneys, etc., 10 cents per pound.
One, two, and three ply Roofing Felt and Building Paper, 1, 2, and 3 cents per square foot.
Materials put up for shipment to any point, with simple instructions for use.
Country merchants should sell these Improved Plastic Slate Roofing Materials, as they can recommend them with entire confidence.

EDWARD VAN ORDEN & CO., Sole Manufacturers,

Established 1863. **79 MAIDEN LANE, NEW-YORK.**

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The only absolutely Perfect Nut-Lock in the market, combining Economy, Simplicity, and Perfect Safety.

The large cut represents the Fish-Plate Washer; the small one on the right is adapted to wood, a bottom view of which is shown in the left-hand cut with beveled side, and the spurs which penetrate the wood. They are in use on a number of Railroads, and give entire satisfaction, supplying the place of Jam-nut and Washer on wood, besides being cheaper and decidedly better. On Fish-Plates, the cost is about the same as that of the Jam-nut.

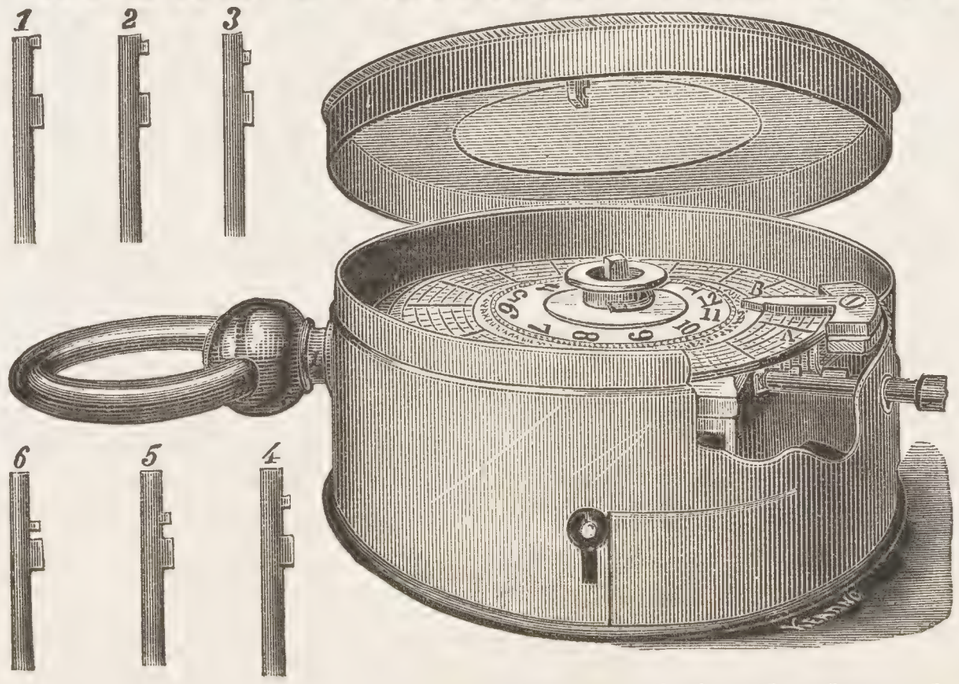
In ordering Fish-Plate Washers, specify height of rail and square of nut. In all other cases use M. C. B.'s standard size nut, flat side next the washer.

⅝ inch Nut, - - 1⅛ inch square. | ⅞ inch Nut, - - 1⅝ inch square.
¾ " " - - 1⅜ " " | 1 " " - - 1⅞ " "

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Important for all large corporations and manufacturing concerns; capable of controlling, with the utmost accuracy, the motions of a watchman, as the same reaches different stations of his beat. Send for Circular.

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P. O. BOX 979,

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N. B.—The public are notified that in my suit against *Imhaeuser & Co.*, of New-York, a decree was made in my favor, June 10, 1874.

Proceedings have been commenced against said *Imhaeuser & Co.* for selling clocks contrary to the order of the Court, and especially the clock with a series of springs in the cover and marked, "Patented October 20, 1874."

All persons discovered using these infringing clocks will be dealt with according to law.

☞ ***In sending for Circular or ordering the above, please mention this paper.***

Car Manufacturers.

Allison, W. C. & Sons	Philadelphia Pa.
Allegheny Car & Transportation Co	Swissvale, Pa.
Altoona Manufacturing Co	Altoona, Pa.
Adrian Car Co	Adrian, Mich.
Arlington Car Manufacturing Co.	Arlington, Vt.
Barney & Smith Manufacturing Co	Dayton, Ohio.
Baker, Jackson & Co	Latrobe, Pa.
Bellefonte Car Manufacturing Co.	Bellefonte, Pa.
Billmeyer & Smalls	York, Pa.
Bradley, Osgood	Worcester, Mass.
Bridgeport Car-Works	Bridgeport, Pa.
Brill, J. G. & Co	Philadelphia, Pa.
Buffalo Car Co	Buffalo, N. Y.
Canada Car Co	Toronto, Canada.
Canda, F. E. & Co	Chicago, Ill.
Cape Fear Building Co	Abbottsburg, N. C.
Cartersville Car Co	Cartersville, Ga.
Central Car & Manufacturing Co	Jackson, Mich.
Clendenning, W. W	Montreal.
Cummings Car-Works	Jersey City, N. J.
Connellsville Machine and Car Co	Connellsville, Pa.
De Pere Iron-Works	De Pere, Wis.
Detroit Car-Works	Detroit, Mich.
Dawson Manufacturing Co	Dawson, Ga.
Dickey, Neill & Co	Toronto.
Dickson Manufacturing Co	Scranton, Pa.
Erie Car-Works	Erie, Pa.
Elmira Car-Works	Elmira, N. Y.
Frederick & Co	Catasauqua, Pa.
Freas Brothers & Thornton	Berwick, Pa.
Gardner, F. & Co.	Carlisle, Pa.
Gill, John L	Columbus, Ohio.
Gilbert, Bush & Co	Troy, N. Y.
Goold, James & Co	Albany, N. Y.
Goodrich Car Co	Augusta, Ga.
Hannibal Car Works	Hannibal, Mo.
Harris, J. & Co	St. John, N. B.
Harrisburg Car Manufacturing Co	Harrisburg, Pa.
Haskell & Barker Car Co	Michigan City, Ind.
Heathcote, Herbst & Co	Glen Rock, Pa.
Hamilton, William & Son	Toronto.
Harlan & Hollingsworth Co	Wilmington, Del
Herrick Car-Works	Oswego, N. Y.
Huntingdon Car-Works	Huntingdon, Pa.
Indiana Car Co	Cambridge City, Ind.
Jackson & Sharp Co	Wilmington, Del.
Jackson & Woodin Manufacturing Co	Berwick, Pa.
Jones, J. M. & Co	West-Troy, N. Y.
Kimball Manufacturing Co	San Francisco, Cal.
Keith, H. T. & I. N	W. Sandwich, Mass.
Laporte Car Manufacturing Co.	Laporte, Ind.
Lombard, Thomas	Augusta, Me.
Lebanon Manufacturing Co	Lebanon, Pa.
Lehigh Car Manufacturing Co	Stemton, Pa.
Litchfield Car Manufacturing Co	Litchfield, Ill.
Mansfield Machine-Works	Mansfield, Ohio.
Michigan Car Co	Detroit, Mich.
McNairy, Claflen & Co	Cleveland, Ohio.
Murray, Dougall & Co	Milton, Pa.
McVay, Walker & Co	Braddock's Field, Pa.
Mowry Car and Wheel Works	Cincinnati, O.
Middletown Car & Manufacturing Co	Middletown, Pa.
Missouri Car and Foundry Co	St. Louis, Mo.
Myers, H. S. & Co. (small cars)	York, Pa.
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New-Haven Car Co	New-Haven, Ct.
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Ohio Falls Car Co	Jeffersonville, Ind
Ontario Car Co	London, Ont.
Oxford Co-operative Car Co	Oxford, Pa.
Patten Car-Works	Bath, Maine.
Peabody & Crangle Bro's	Calais, Me.
Peters, Simon	Quebec.
Petersburg Car Co	Petersburg, Va.
Pittsburg Car-Works	Pittsburg, Pa.
Pittsburg and McKeesport Car Co	McKeesport, Pa.
Pittsburg Car and Locomotive Co	Pittsburg, Pa.
Portland Co	Portland, Me.
Pullman Car Co	Chicago and Detroit.
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Ranlet Car Manufacturing Co	Laconia, N. H.
Russell & Co	Massillon, Ohio.
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Schall, Michael	York, Pa.
Schenectady Car-Works	Schenectady, N. Y.
Shaaber & Johnston	Reading, Pa.
South-Western Car Co	Jeffersonville, Ind.
Shoenberger & Bryant	Duluth, Minn.
St. Charles Manufacturing Co	St. Charles, Mo.
Stephenson, John & Co	New-York, N. Y.
Star Mining & Manufacturing Co	Henderson, Ky.
Taunton Car Co	Taunton, Mass
Terre Haute Car & Manufacturing Co	Terre Haute, Ind.
Tredegar Co	Richmond. Va.
Watsontown Car Co	Watsontown, Pa.
Wharton, Thomas J	Brunswick, Ga.
Wason Manufacturing Co	Springfield, Mass
Weimer, P. L. & Bros	Lebanon, Pa.
Wright, Andrew	St. Louis, Mo.
Wyoming Valley Manufacturing Co	Wilkesbarre, Pa.
Wells, French & Co	Chicago, Ill.
Wilmington Car-Works	Wilmington, Del.

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American Paper Car-Wheel Co	Hudson, N. Y.
Atlantic Iron-Works	Portsmouth, Va.
Baltimore Car-Wheel Foundry Co	Baltimore, Md.
Barnum Richardson Manufacturing Co	Chicago, Ill.
Barnum Richardson Co	Lime Rock, Conn.
Barney & Smith Manufacturing Co.	Dayton, Ohio.
Bass & Hanna	Fort Wayne, Ind.
Blanchard & Arnold	Milwaukee, Wis.
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Bowler, Mayer & Brayton	Cleveland, Ohio.
Cayuta Wheel & Foundry Co.,	Waverly, N. Y.
Chicago Car-Wheel Co	Chicago, Ill.
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Dawson Manufacturing Co	Dawson, Ga.
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Ensign Manufacturing Co	Huntingdon, W. Va.
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Green's Car-Wheel Manufacturing Co	St. Louis, Mo.
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Harrisburg Car Manufacturing Co	Harrisburg, Pa.
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Jackson & Woodin	Berwick, Pa.
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Lehigh Car-Wheel & Axle Works	Catasauqua, Pa.
Litchfield Car M'f'g Co	Litchfield, Ill.
Lobdell Car-Wheel Works	Wilmington, Del.
London Car-Wheel Co	London, Can.
Louisville Car-Wheel & Railway Supply Co	Louisville, Ky.
Middlebrook & Mack	Oswego, N. Y.
Missouri Car and Foundry Co	St. Louis, Mo.
Mowry Car and Wheel Works	Cincinnati, Ohio.
Nash, John & Co	Cincinnati, Ohio.
Ohio Falls Car Co	Jeffersonville, Ind.
Parker & Bailey	St. Paul, Minn.
Pettengill, Glass & Co	Cleveland, Ohio.
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Rutland Foundry & Machine Co	Rutland, Vt.
Sterling Car-Wheel Foundry	Columbus, Ohio.
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Tredegar Company	Richmond, Va.
Toronto Car-Wheel Co	Toronto, Can.
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Washburn Car-Wheel Manufacturing Co	Worcester, Mass.
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Danforth & Cooke	Paterson, N. J
Dawson & Baily (light locomotives)	Connellsville, Pa
Dickson Manufacturing Co	Scranton, Pa.
Grant Locomotive Works	Paterson, N. J.
Hinckley Locomotive Works	Boston, Mass.
Manchester Locomotive Works	Manchester, N. H
Mason, William	Taunton, Mass.
McKay Iron and Locomotive Works	Jersey City, N J.
Portland Company	Portland, Me.
Porter, Bell & Co. (light locomotives)	Pittsburg, Pa.
Pittsburg Locomotive Works	Pittsburg, Pa.
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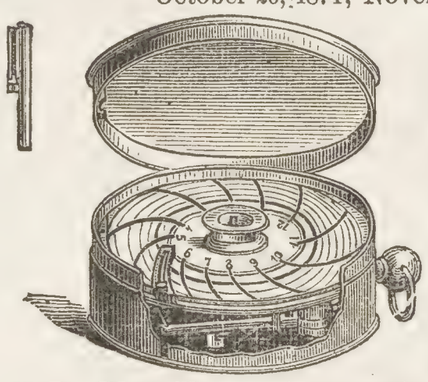
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N. B.—We will protect our customers against all claims of other patentees, and especially against J. E. Buerk, of Boston, Mass., who has never brought suit for any alleged infringement by clocks made under the above-named patents, and by us offered for sale. Send for Circular to,

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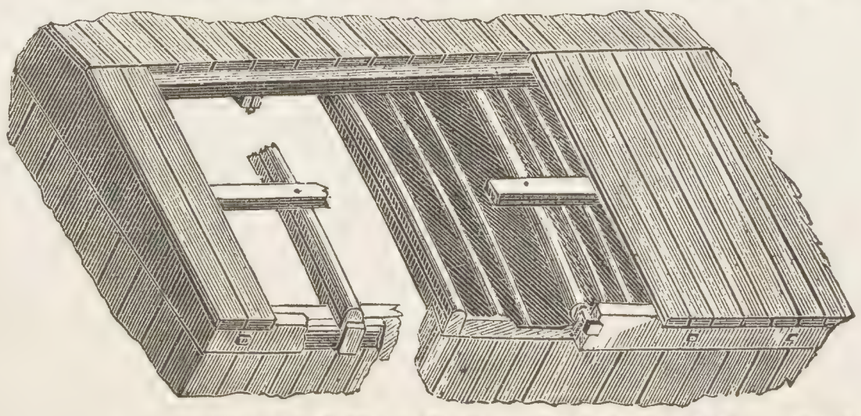
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Salt Lake Division	W. H. McKenzie	G. J. Turner.	Ogden, Utah.
California Pacific Division	D. Rutherford	D. Rutherford	Vallejo, Cal.
Central Vermont	‖‖J. M. Foss	J. M. Foss	St. Albans, Vt.
Harlem Extension Div	W. A. Short	W. A. Short	Ruthland, Vt.
New-London & Northern Division	J. W. Dow	J. W. Dow	New-London, Ct.
Ogdensburg & L. Champlain Div.	E. Leline		Malone, N. Y.
Ogdensburg & L. Champlain Div.		Geo. Colepas	Ogdensburg, N. Y.
Rutland Division	W. A. Short	W. A. Short	Rutland, Vt.
Charleston & Savannah	H. T. Calder		Charleston, S. C.
Chesapeake & Ohio	John McFarland	J. N. King	Richmond, Va.
Chesapeake & Ohio	§T. J. Hamer	H. C. Bassinger	Huntingdon, W. Va.
Cheraw & Darlington	D. W. Haines	A. M. Corrie	Florence, S. C.
Champlain Trans. Co	H. T. Calder		Burlington, Vt.
Cheshire & Ashuelot	F. A. Perry	F. A. Perry	Keene, N. H.
Charlotte, Columbia & Augusta	Robert King	J. C. Troeger	Columbia, S. C.
Chicago & Pacific	A. S. Gurnee		Chicago, Ill.
Chicago & Lake Huron	§§Wm. C. Faulkner		Port Huron, Mich.
Eastern Division	E. Hollis		Port Huron, Mich.
Western Division	Stephen Tinker		Battle Creek, Mich.
Chicago & North-Western	§Geo. W. Tilton	William Campbell	Chicago, Ill.
Wiscon. Mad. & Mill. Divis		Wm. Campbell	Chicago, Ill.
Wiscon. Mad. & Mill. Divis		Henry Hull	Fond du Lac, Wis.
Galena Division		Hugh Gray	Chicago, Ill.
Iowa Division	C. C. Elliott	H. L. Preston	Clinton, Iowa.
Peninsula Division	Geo. White		Escanaba, Mich.
Chicago & Alton	John A. Jackman	R. Reniff	Bloomington, Ill.
Chicago, Burlington & Quincy	‡Wm. Wilson	††W. W. Wilcox	Aurora, Ill.
Galesburg Division	James Lamb	H. J. F. Small	Galesburg, Ill.
Creston Division	Joel West		Creston, Iowa.
Burlington Division	John Bassler		Burlington, Iowa.
Chicago, Clinton & Dubuque	P. R. Sutton		Dubuque, Iowa.
Chicago, Dubuque & Minnesota	P. R. Sutton		Dubuque, Iowa.
Chicago, Rock Island & Pacific	T. B. Twombly	B. K. Verbryck	Chicago, Ill.
Chicago & Michigan Lake Shore	†T. J. Hartswell	D. Sutherland	St. Joseph, Mich.
Chicago, Danville & Vincennes	A. H. De Clerq		Danville, Ill.
Chicago, Milwaukee & St. Paul	J. M. Lowry		
La Crosse & P. Du Chien Div.		Wm. E. Kittredge	Milwaukee, Wis.
Northern Div.		John Bailie	Milwaukee, Wis.
Iowa & Minn. Div.	J. Pettee	J. Pettee	Minneapolis, Minn.
Hastings & Dakota Division	C. C. Clements		Hastings, Minn.
Chicago & Iowa	H. S. Bryan		Aurora, Ill.
Cincinnati, Wabash & Michigan	E. M. Porter		Wabash, Ind.
Cincinnati, Hamilton & Dayton	James Eckford	W. H. H. Allison	Cincinnati, Ohio.
Indianapolis Division	Edward Moore		Indianapolis, Ind.
Cincinnati, Lafayette & Chicago	Charles E. Gore		Lafayette, Ind.
Cincinnati & Muskingum Valley	Leroy Kells	Daniel Jewell	Lancaster, Ohio.
Cincinnati, Sandusky & Cleveland	J. R. Ames	J. R. Ames	Sandusky, Ohio.
Cleveland, Col., Cin. & Indianapolis	‡L. S. Young	††William F. Smith	Cleveland, Ohio.
Indianapolis Division	A. R. McAlpine		Galion, Ohio.
Indianapolis Division		R. Attridge	Indianapolis, Ind.
Cincinnati Division	D. Carmichael	D. Carmichael	Delaware, Ohio.
Columbus Division	F. G. Kaufholz	Wm. Cleve	Cleveland, Ohio.
Cleveland & Pittsburg	N. E. Chapman	A. Steinbrunner	Cleveland, Ohio.
Cleveland, Mt. Vernon & Delaware	J. W. Holloway	J. W. Holloway	Akron, Ohio.
Cleveland, Tuscarawas Val. & Wheeling	W. F. Turreff		Cleveland, O.
Cobourg, Peterboro & Marmosa	Wm. Polson		Cobourg, Canada.
Columbus, Chicago & Indiana Central	(See Pitts. Cinn. & St. Louis)		
Columbus & Hocking Valley	H. S. Wallace	H. S. Wallace	Columbus, Ohio.
Concord	Chs. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Portsmouth	C. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Claremont	J. N. Lander	A. Langmaid	Concord, N. H.
Connecticut River	§Wm. H. Stearns	R. Hitchcock	Springfield, Mass.
Connecticut Valley	C. W. Hollister	N. A. Smith	Hartford, Ct.
Connecticut Western	N. Slingland		Hartford, Ct.
Contoocook River			Concord, N. H.
Conn. & Passumpsic Rivers	Geo. Kilby		Lyndonville, Vt.
Corning, Cowanesque & Antrim	O. C. Patchell	O. C. Patchell	Corning, N. Y.
Cumberland Valley	A. S. Hull	C. W. Nitterhouse	Chambersburg, Pa.
Cumberland & Pennsylvania	W. L. Jordan	Nathan Binnix	Mt. Savage, Md.
D			
Dakota Southern	Jas. Whitney	A. A. Meckling	Yankton, Dak.
Danbury & Norwalk	Charles A. Craig	C. A. Craig	Danbury, Ct.
Davenport & St. Paul	James Russell		Davenport, Iowa.
Dayton & Union	H. S. Gordon	J. F. Feicht	Dayton, Ohio.
Dayton & Michigan	John Black	W. H. H. Allison	Cincinnati, Ohio.
Delaware, Lackawanna & Western	Walter Dawson	Robert McKenna	Scranton, Pa.
Morris & Essex Division	W. H. Lewis	L. S. Barber	Hoboken, N. J.
Denver & Rio Grande	John Greenwood		Denver, Col.
Detroit, Ft. Wayne & Logansport	W. A. Carpenter		Bankers, Mich.
Detroit & Milwaukee	C. M. Hanson		Detroit, Mich.
Detroit, Lansing & Lake Michigan	Tho. E. Roberts		Ionia, Mich.
Delaware & Hudson Canal Co.	‖‖R. C. Blackall		Albany, N. Y.
Dorchester & Delaware			Cambridge, Md.
Dubuque South-Western	James Rollo	James Rollo	Farley, Iowa.
Dutchess & Columbia	W. G. Vanbuskirk	H. A. Webster	Fishkill, N. Y.
Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett.	Dunkirk, N. Y.
E			
Eastern		J. P. Somerby	Salem, Mass.
Eastern	John Thompson		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L. Weaver	Riverton, Ky.
East-Tennesee, Virginia & Georgia	C. A. Hodge		Knoxville, Tenn.
Erie Railway	§§Frank K. Hain		Susquehanna, Pa.
Erie Railway	Robert Wallace		Susquehanna, Pa.
Erie Railway	V. Blackburn		Jersey City, N. J.
Erie Railway	F. M. Wilder	M. Wilder	Buffalo, N. Y.
Erie Railway	J. W. Chapman	J. W. Chapman	Hornellsville, N. Y.
Erie Railway		‖D. B. Goodell	Elmira, NY.
Erie Railway		‖J. B. Hill	Jersey City N. J.
Erie Railway	J. Van Vechten	‖J. Van Vechten	Port Jervis, N. Y.
Erie Railway	A. T. Back		Rochester, N. Y.
Erie & Pittsburg	G. J. Parkin	G. J. Parkin	Erie, Pa.
European & North Am. (of Maine)	A. O. Bailey	J. H. Brown	Oldtown, Maine.
Evansville & Crawfordsville	John L. White	Joseph Stiker	Evansville, Ind.
Evansville, Terre Haute & Chicago	§§Beriah Warren		Terre Haute, Ind.
F			
Fitchburg	Geo. A. Cooledge	Enos Varney	Charlestown, Mass.
Vermont & Mass. Div.	W. A. Foster	Jacob Marsh	Fitchburg, Mass.
Fitchburg & Worcester	John Webster	Samuel Stevens	Fitchburg, Mass.
Flint & Pere Marquette	Sanford Keeler	‖R. B. More	East-Saginaw, Mich.
Florida	Ezra Gray	G. Hernandez	Fernandina, Fla.
Flushing & North Shore	Wm. La Suer	C. Wilkinson	Hunter's Point, L. I.
Fort Wayne, Jackson & Saginaw		Lewis Colburn	Jackson, Mich.
G			
Galveston, Harrisburg & San Antonio	S. W. Tozer.		Harrisburg, Texas.
Galveston, Houston & Henderson	Jno. G. Coulon	Jno. G. Coulon	Galveston, Texas.
Georgia	William Hardman	T. M. Preval,	Augusta, Ga.
Gilman, Clinton & Springfield	W. B. McKenna		Clinton, Ill.
Grand Tower & Carbondale.	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk		Warren Noyes	Gorham, Me.
Grand Trunk	†Herbert Wallis	Wm. McWood	Montreal, Canada.
Grand Trunk.			Sherbrooke, Can.
Grand Trunk		B. J. Mitchell	Portland, Me.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne, Ind.
Great Western of Canada	†John Ortton	F. Childs	Hamilton, Canada.
Green Bay & Lake Pepin.	J. H. Erwin		Green Bay, Wis.
Greenville & Columbia	R. H. Anderson	R. H. Anderson	Helena, S. C.
H			
Hackensack & New-York	Abra'm Angausen		Hackensack, N. J.
Hanover Branch	John J. Bingley	Henry Britcher	Hanover, Pa.
Hannibal & St. Joseph	**Jno. MacKenzie		Hannibal, Mo.
Hartford, Providence & Fishkill	Edwin Garfield	V. D. Perry	Hartford, Ct.
Housatonic	C. R. Morris.	J. J. Ferris	Falls Village, Ct.
Houston & Texas Central	L. C. Noble	James McGee	Houston, Texas.
Huntington & Broad-Top Mountain	W. W. Coller	M. Tellerhoof	Saxton, Pa.
I			
Illinois Central	**S. J. Hayes	W. B. Snow	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia, Ill.
North Division	J. B. Edams		Amboy, Ill.
Iowa Division	Thomas W. Place		Waterloo, Iowa.
Illinois Midland	J. G. Clifford	G. Clifford	Paris, Ill.
Illinois & St. Louis.	James Hazen		Bellville, Ill.
Indianapolis, Cincinnati & Lafayette	J. S. Patterson	S. Griffith	Cincinnati, Ohio.
Indianapolis, Peru & Chicago.	John McKenna	John McKenna	Peru, Ind.
Indianapolis & St. Louis	A. J. Sanborn		Mattoon, Ill.
Indianapolis, Bloomington & Western	**H. L. Cooper	A. J. Allen	Urbana, Ill.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ia.
International & Great Northern	R. B. Small		Palestine, Texas.
Intercolonial	Wm. Whitney	Edw. Shaffer.	Moncton, N. B.
Iron	Perry Scott	Clem. Roetling	Ironton, Ohio.
Ithaca & Athens	F. A. Brown.		Ithaca, N. Y.
J			
Jacksonville, Pensacola & Mobile	H. D. Kennedy		Jacksonville, Fla.
Jeffersonville, Madison & Indiana	Reuben Wells.		Jeffersonville, Ind.
Junction & Breakwater	J. A. Maguire.		Lewes, Del.
K			
Kalamazoo, Allegan & Grand Rapids			Kalamazoo, Mich.
Kansas City, St. Joseph & Council Bluff	Wm. D. Rowley	Wm. D. Rowley	St. Joseph, Mo.
Kansas Central	John Davis		Leavenworth, Kan.
Kansas Pacific	**L. H. Waugh	H. M. Roberts	Wyandotte, Kansas
Denver Pacific Div	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div.	**L. H. Waugh		Wyandotte, Kansas.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Junction City & Ft. Kearney Div	**L. H. Waugh.		Wyandotte, Kansas.
Arkansas Valley Div	**L. H. Waugh		Wyandotte, Kansas.
Kentucky Central	J. R. Ledyard	J. L. Hackathorn.	Covington, Ky.
Keokuk & Des Moines Valley	S. W. Wakefield	M. Sessions	Keokuk, Iowa.
King's Mountain	E. Thomas	E. Thomas	Chester, S. C.
Knox & Lincoln	§§E. R. Hamlin	Benj. Soule	Bath, Me.
Knoxville & Charleston			Knoxville, Tenn.
L			
Lackawanna & Bloomsburg	Chas. Graham	Chas. Graham	Kingston, Pa.
Lake Erie & Louisville	John Pero		Fremont, Ohio.
Lake Ontario Shore	Wm. Harris		Oswego, N. Y.
Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland, Ohio
Michigan Southern Division	Geo. W. Stevens		Elkhart, Ind.
" " "		S. S. Knapp.	Adrian, Mich.
Toledo Division	J. M. Sanborn.	Frank O. Bray	Norwalk. Ohio.
Erie Division	L. O. Gassett.	J. Withyecombe.	Cleveland Ohio.
Buffalo Division	W. L. Wallace	A. C. Robson	Buffalo, N. Y.
Lake Superior & Mississippi		John Hill	St. Paul, Minn.
Lehigh Valley	John I. Kinsey		South-Easton, Pa.
Lehigh Valley	P. Hofecker	E. R. Brown	Weatherly, Pa.
Lehigh Valley	John Campbell	Mauch Chunk, Pa.	Delano, Pa.
Lehigh Valley	D. Clark		Hazleton, Pa.
Leavenworth, Lawrence & Gal	J. S. McCrum		Lawrence, Kansas.
Little Rock & Fort Smith	James Eblin	D. R. Wing	Argenta, Ark.
London & Port Stanley			London, C. W.
Louisville, New-Albany & Chicago	Geo. Ruhlandt	Geo. Helfrich	New-Albany, Ind.
Long Island	Chs. A. Thompson	C. A. Thompson	Hunter's Point, L.I.
Louisville, Cincinnati & Lexington	S. S. Pilson	S. S. Pilson	Louisville, Ky.
Louisville & Nashville	†Thatcher Perkins	Isaac M. Owens	Louisville, Ky.
Louisville Division	D. P. Rennie		Louisville, Ky.
Clarksville Division	Jas. Montgomery		Bowling Green, Ky.
Nashville & Decatur Division	W. J. Steele		Nashville, Tenn.
South & North Ala. Div.	C. E. Slade	W. L. Gude	Birmingham, Ala.
Memphis & Ohio Div.	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Louisville, Paducah & So. Western	W. D. Robb	Frank Looney.	Elizabethtown, Ky
M			
Macon & Augusta			Macon. Ga.
Macon & Brunswick	R. Wagnon	R. Wagnon	Macon, Ga.
Macon & Western	D. M. Gogel	James A. Knight.	Macon, Ga.
Maine Central	J. W. Philbrick	J. W. Philbrick.	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div	John Ellis	C. H. Kenison	Augusta, Me.
Maine Central Division	John F. Merrill.		Waterville Me.
Manchester & Lawrence	Chas. L. Eastman.	M. W. Dickerman.	Concord, N. H.
Marietta, Pittsburg & Cleveland	W. J. Adams		Marietta, Ohio.
Marietta & Cincinnati	E. M. Bosley	E. M. Bosley	Chillicothe, Ohio.
Marquette, Houghton & Ontonagon	C. J. Shellhorn	H. D. Lyons	Marquette, Mich.
Maryland & Delaware	Samuel Peters		Greensboro, Md.
Memphis & Little Rock	Tho. Rennell	P. Twitchell	Argenta, Ark.
Memphis & Charleston	A. Ross	A. W. Drew	Memphis, Tenn.
Memphis & Charleston	H. N. Burford	Fabien Varin	Huntsville, Ala.
Mineral Point	Robert Hay	Robert Hay	Mineral Point, Wis.
Mineral Range	C. H. Fox.		Hancock, Mich.
Mississippi & Tennessee	Geo. Haszinger	J. Riny	Memphis, Tenn.
Michigan Central	§§Geo. S. Chalender.	Geo. S. Chalender	Jackson, Mich.
Michigan Central		Henry Whiting	Detroit, Mich.
Midland Pacific	A. C. Stiles		Lincoln, Neb.
Mississippi Valley & Western	J. S. Pickering		Canton, Mo.
Missouri, Iowa & Nebraska	J. G. Crozier		Alexandria, Mo.
Missouri, Kansas & Texas	G. W. Cushing		Parsons, Kan.
Missouri, Kansas & Texas		J. Townsend	Sedalia, Mo.
Missouri, Kansas & Texas	J. E. Wiggins		Hannibal, Mo.
Missouri River, Fort Scott & Gulf	John S. McCrum	Alex. Montier	Kansas City, Mo.
Mobile & Montgomery	James McFarland.	L. Barham	Montgomery, Ala.
Mobile & Girard	C. D. Wall		Girard, Ala.
Mobile & Ohio		John McHugh	Mobile, Ala.
Mobile & Ohio	R. McDougal	I. T. Booth	Whistler, Ala.
Mobile & Ohio	B. S. Herring		Macon, Miss.
Mobile & Ohio	R. H. Briggs		Jackson, Tenn.
Montgomery & Eufaula	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Algiers, La.
Montreal Northern Colonization	§§C. G. C. Simpson		Montreal, Can.
N			
Nashville & Chattanooga	John U. Eastman.	J. G. Sawyer	Nashville, Tenn.
Naugatuck	Henry Hanford	George W. Gray.	Bridgeport, Ct.
New-Bedford	G. W. Reynolds.	John L. Gibbs	New-Bedford, Mass.
New-Brunswick	P. Logan	C. M. Kinnon.	Fredericton, N. B.
New-Brunswick & Canada	Tho. Armstrong	G. Houlton	St. Andrew's, N. B
New-Haven & Northampton	Henry Fox.	Henry Fox.	New-Haven, Ct.
New-Jersey Midland	Duane Searle		Wortendyke, N.J.
New-Jersey & New-York	A. J. Auryansen		Jersey City, N. J.
New-Jersey Southern	Rufus Blodgett.		Manchester, N. J.
New-Orleans, St. Louis & Chicago		‡‡——. Allen.	McComb City, Miss.
New-Orleans, St. Louis & Chicago	§§L. H. Sellars		Water Valley, Miss.
New-Orleans, St. Louis & Chicago		G. H. White	McComb City, Miss.
New-Orleans & Mobile	§Josiah Bettis	W. J. Henderson.	Mobile, Ala.
New-York, Kingston & Syracuse	A. Q. Mackenbush.	G. Dikeman	Syracuse, N. Y.
New-York & Harlem	Wm. M. Strong	C. E. Garey	New-York.
New-York Central & Hudson River		††Leander Garey.	New-York.
New-York Central Division	‡G. B. Van Vorst	D. Hoit	West-Albany, N. Y.
New-York Central Division	Henry Watkeys.		Syracuse, N. Y.
New-York Central Division	Amos Gould	James Leary.	Rochester, N. Y.
New-York Central Division	Jas. Butman	Wm. Johnson	Buffalo, N. Y.
New-York Central Division	S. L. White	George Rowe	Niagara Falls, N. Y
Hudson River Division	‡Wm. Buchanan.	E. A. Olmstead.	New-York City.
Hudson River Division	R. Greenalch	J. J. Conaghty	E. Albany, N. Y.
New-York, Boston & Montreal	W. G. Van Buskirk	H. A. Webster	Dutchess Junc., N.Y
New-York & Oswego Midland	§§W. A. Dripps		Oswego, N. Y.
Eastern Division	J. Minchell		Middletown, N. Y.
Middle Division	Tho. Howard		Norwich, N. Y.
Northern Division	Edward Van Vleck.	T. D. Day	Oswego, N. Y.
New-York & New-England	Geo. E. Boyden	Elias E. Pratt	Boston, Mass.
New-York, Providence & Boston.	Jas. H. Anderson	Jas. H. Anderson.	Providence, R. I.
New-York, New-Haven & Hartford	§§H. Kittendorf	James Denver	New-Haven, Ct.
New-York, New-Haven & Hartford	E. S. Brewer	F. Leppens.	Hartford, Ct.
Northern Central	G. W. Rhodes		Baltimore, Md.
Northern Central	James Strode	G. W. Demarest.	York, Pa.
Northern New-Hampshire	James W. Lander.	Albert Langmaid.	Concord, N. H.
Northern of Canada	P. Clark.	P. Clark	Toronto, Can.
Northern Pacific	**H. A. Towne		Brainerd, Minn.
Minnesota Division	W. H. Lewis		Brainerd, Minn.
Dakota Division	C. W. Rossiter		Fargo, D. T.
Pacific Division	J. F. Curtis		Kalama, W. T.
North-Carolina	Rufus D. Wade	B. G. Sergeant	Co. Shops, N. C.
North-Louisiana & Texas	C. H. Tull		Monroe, La.
North-Pennsylvania	Franklin Roop	Franklin Roop	Philadelphia, Pa.
North-Eastern	D. W. Haines	A. M. Corrie	Florence, S. C.
Norwich & Worcester	Richard Colburn	G. R. Bentley	Norwich, Ct.
O			
Ohio & Mississippi		G. Hibbert	Cochran, Ind.
Ohio & Mississippi	‡J. D. W. Potts		Seymour, Ind.
Oil City & Pithole	George Thompson.		Pithole, Pa.
Oil Creek & Alleghany River	H. J. Bookhammer.	John Monks	Oil City, Pa.
Old Colony & Newport	J. K. Taylor	A. Gleason	Boston, Mass.
Oregon & California	§§J. Brandt.		Portland, Oregon.
Owensburg & Russellville	J. R. Osborne		Owensburg, Ky.
P			
Paducah & Memphis	J. S. Mackay		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Panama	Chas. E. Stewart		Aspinwall, N. G.
Pacific of Missouri	§§John Hewitt	J. Hodge	St. Louis, Mo.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Pennsylvania	§§T. N. Ely		Altoona, Pa.
Pennsylvania	H. D. Garrett	I. W. Van Houten.	W. Philadelphia, Pa.
Pennsylvania	E. L. Caum	Samuel W. Myers.	Harrisburg, Pa.
Pennsylvania	G. W. Strattan	John P. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver.	R. S. Ramsey	Pittsburg, Pa.
New-Jersey Division	L. A. Bosdevex		Meadow Shops, N. J.
New-Jersey Division		David H. Baker.	Jersey City, N. J.
West-Penn. Division	C. B. Street.	M. H. Fales	Blairsville, Pa.
Peoria & Rock Island	Geo. Gregg		Peoria, Ill.
Peoria, Pekin & Jacksonville	R. F. Hurd	R. F. Hurd	Pekin, Ill.
Petersburg & Weldon	R. B. Andrews	Alex. Wright	Petersburg, Va.
Philadelphia, Wilmington & Baltimore	S. A. Hodgman.	Wm. Lundgren	Wilmington, Del.
Philadelphia & Baltimore Central	S. D. Danfield.	Samuel D. Danfield.	Chester, Pa.
Philadelphia and Erie	Martin Walls		Sunbury, Pa.
	W. L. Forster		Renovo, Pa.
	W. L. Holman		Kane, Pa.
	W. T. Smith.		Erie, Pa.
	§§Howard Fry		Erie, Pa.
Philadelphia & Reading	L. B. Paxson	Aaron Steinbach.	Reading, Pa.
Germantown & Norris'n Div.	Jackson Richards		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis		D. F. Andregg	Dennison, Ohio.
Pittsburg & Columbus Division	Ross Kells	Thos. D. Furgusen.	Steubenville, Ohio.
Little Miami Division		M. P. Ford	Columbus, Ohio.
Little Miami Division	J. H. Setchel	John McVay	Cincinnati, Ohio.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlin.	Columbus, Ohio.
Col., Cin. & Ind. Division	Geo. H. Prescott	Geo. H. Prescott.	Logansport, Ind.
Pittsburg, Fort Wayne & Chicago	S. M. Cummings.	John Marquis	Allegheny, Pa.
Pittsburg, Fort Wayne & Chicago	J. M. Boon.	Israel Lee	Fort Wayne, Ind
Pittsburg, Fort Wayne & Chicago		J. J. Kirkland	Crestline, Ohio.
Pittsburg, Virginia & Charlston	W. Lininger		Pittsburg, Pa.
Pittsburg, Washington & Baltimore	§Wm. Stearns		Connellsville, Pa.
Pittsburg, Washington & Baltimore	J. E. Sampsel	J. M. Leach	Pittsburg, Pa.
Portland & Rochester	John G. Brady	John G. Brady	Portland, Me.
Portland & Oxford Central	Geo. W. Battles.	Geo. W. Battles.	Buckfield, Me.
Portland, Saco & Portsmouth	John Donnell		Portland, Me.
Port Royal	Geo. Riley	J. H. Milton	Augusta, Ga.
Port Hope, Lindsay & Beaverton	H. G. Taylor	H. G. Taylor	Port Hope, Can.
Portsmouth, Gt. Falls & Monmouth	James Tucker	E. Fall	Union Village, N.H.
Poughkeepsie & Eastern	John L. Driscoll.	Jerry Wigg	Poughkeepsie, N. Y.
Providence & Worcester	Joseph Kelly	Olney L. Smith	Providence, R. I.
Providence, Warren & Bristol	Rufus Smith	J. Brightman	Bristol, R. I.
Q			
Quincy, Alton & St. Louis	J. O. Gravell	W. G. Gilbert	Quincy, Ill.
Quincy, Missouri & Pacific	W. F. Smith	W. F. Smith	Kirksville, Mo.
R			
Raleigh & Gaston	B. R. Harding	B. R. Harding	Raleigh, N. C.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Richmond, Fredericksburg & Potomac	H. Kuhn	W. H. Trainham	Richmond, Va.
Richmond, Danville & Piedmont		J. B. Vaughan	Richmond, Va.
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond, Va.
Richmond & York River	C. H. Harris	J. L. Thompson	Richmond, Va.
Rive De Loup	P. A. Logan	C. R. McKinnin	Fredericton, N. B.
Rome, Watertown & Ogdensburg	Abram Klohs	H. H. Sessions	Rome, N. Y.
Rome, Georgia	O. W. Harbin	O. W. Harbin	Rome, Ga.
Rochester & Genesee Valley	M. E. Brown.	M. Wilder	Buffalo, N. Y.
Rockford, Rock Island & St. Louis	Joseph Elder	T. F. Nolte	Beardstown, Ill.
S			
Saginaw Valley & St. Louis	W. S. Thompson		Saginaw, Mich.
San Antonio & Mexican Gulf	W. T. Bingham		Victoria, Texas.
Savannah & Charleston	P. J. Hutson	J. D. Murphy	Charleston, S. C.
Seaboard & Roanoke	§§M. M. Pendleton		Portsmouth, Va.
Selma & Gulf	Wm. T. Daughtrey.		Selma, Ala.
Selma, Rome & Dalton		W. W. Peirce	Selma, Ala.
Selma, Marion & Memphis	Dolphus Gay		Marion, Ala.
Sheboygan & Fond du Lac	John Hickey	John Hickey	Sheboygan, Wis
Sioux City & Pacific	C. H. Foster		Missouri Val., Iowa.
Southern Pacific of California	J. P. Wilson	F. N. Bellisle	San Francisco, Cal.
South-Carolina	W. B. Smith	John Reed	Charleston, S. C.
Southern Central	Chas. G. Brown	H. Mooney	Auburn, N. Y.
Southern, of Long Island	Mark Brear	C. Wilkinson	Brooklyn, N. Y.
Southern Minnesota			Wells, Minn.
South-Western of Georgia	C. D. Wall.		Columbus, Ga.
South-Western of Georgia	D. M. Gogel	James A. Knight.	Macon, Ga.
South Side of Long Island	A. P. Doane	A. P. Doane	Williamsburg, L.
Spartanburg & Union	J. N. Benner	Jacob Rice	Union C. H., S. C
Springfield, Athol & Northeastern	W. E. Granger		Springfield, Mass.
Stanstead, Shefford & Chambly	W. H. Smith		Waterloo, C. E.
Stockton & Ione		W. T. Hoyt	Stockton, Cal.
Stonington & Providence	J. H. Anderson	J. H. Anderson	Providence, R. I.
St. Croix & Penobscot	Edward Bolton	A G. Page	Milltown, Me.
St. Joseph & Denver City	E. Sleppy		St. Joseph, Mo.
St. Lawrence & Ottawa	Calvin Dame.	Calvin Dame.	Prescott, Canada.
St. Louis, Iron Mountain & Southern	O. A. Haynes	Oscar Doolittle	Carondelet, Mo.
Arkansas Division	L. Finlay.	L. Finlay	Little Rock, Ark.
St. Louis, Vandalia, T. Haute & Ind.	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Indianapolis Division	Wm. Riley		Terre Haute, Ind.
Vandalia Division	A. J. Sanborn.		Effingham, Ind.
St. Louis, Alton & Terre Haute.	**Beriah Warren		St. Louis, Mo.
St. Louis, Salem & Little Rock	I. I. Upchurch		Steelville, Mo.
St. Louis & South-Eastern	L. B. Salisbury		Mt. Vernon, Ill.
Nashville Division	E. M. Hamstone		Edgefield, Tenn.
St. Paul & Pacific	J. C. Monroe	T. W. Heathcote	St. Paul, Minn.
St. Paul & Sioux City	F. C. Butterfield	J. W. Lydic	Shakopee, Minn.
St. Louis, Kansas City & Northern	W. H. Selby	C. S. Buck	Moberly, Mo.
St. Louis, Lawrence & Western	J. A. Hagan.		Tonawanda, Pa.
Sullivan & Erie			Syracuse, N. Y.
Syracuse, Binghamton & New-York	H. H. Dawson	David Burling	Syracuse, N. Y.
Syracuse Northern	W. Garrison	L. W. Smith	Syracuse, N..
T			
Tennessee & Pacific	William McKeand.	William McKeand.	Nashville, Tenn.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	J. A. Hanglin		Marshall, Texas
Tioga	Peres Bonny	D. H. Stratton	Blossburg, Pa
Toledo, Peoria & Warsaw	W. O. Hewitt	R. M. Hemphill	Peoria, Ill.
Toledo, Wabash & Western	§J. B. Morse		Fort Wayne, Ind
Toledo, Wabash & Western	John C. Wills.		Lafayette, Ind.
Toledo, Wabash & Western	Jacob Johann		Springfield, Ill.
Toledo, Wabash & Western		U. H. Kohler	Toledo, Ohio.
Toronto, Grey & Bruce.	Wm. Bowstead		Toronto, Can
Toronto & Nipissing	J. Haggus.		Toronto, Canada.
Troy & Boston	Foster Church	R. V. Coon	Troy, N. Y.
U			
Union Pacific	§I. H. Congdon	‡‡Geo. E. Stevens	Omaha, Nebraska.
Eastern Division		A. M. Collett	Omaha, Neb.
Eastern Division		H. P. Makely	Grand Island, Neb.
Mountain Divison		Jno. E. Davis	Cheyenne, W. T.
Laramie Division		Floyd Heavaner	Laramie, W. T.
Western Division		C. A. Phipps	Evanston, U. T.
Utah Central	Thos. Pierpont	Thos. Pierpont	Salt Lake City.
Utica & Black River	John Bailey	David James	Utica, N. Y.
Utica, Chenango & Susquehanna	C. H. Brown		Utica, N. Y.
V			
Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.
Virginia & Truckee	Wm. Bowker		Carson, Nev.
W			
Wash. City, Va. Midland & Gr. Southern	Jas. E. Waddey	J. T. Nalls	Alexandria, Va.
Washington & Ohio	Edward Dunn	Joshua Harrison	Alexandria, Va
Welland	James Taylor	James Chase	St. Catharine, C. W.
Westchester & Philadelphia	John Moyer	N. Pawling	Philadelphia, Pa.
Western & Atlantic	John H. Flynn	Wm. Grambling	Atlanta, Ga.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Western Maryland	Wm. Lannan	J. H. Nussear	Union Bridge, Md.
Western North-Carolina	J. D. Hollister	J. D. Hollister	Salisbury, N. C.
Western of Alabama	John McVey	F. M. Wade	Montgomery, Ala.
Western R. R. N. C	M. W. Atkinson	M. W. Atkinson	Fayetteville, N. C.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
West-Feliciana	J. A. Tilton	Wm. McKelvey	Woodville, Miss.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
West-Wisconsin	Matt Ellis	J. C. Fischer	Hudson, Wis.
White Water Valley	A. W. Britton		Harrison, Ohio.
Wilmington, Columbia & Augusta	W. H. Turrintine		Wilmington, N. C.
Wilmington & Weldon	John Bissit	C. R. Clowe	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Winona & St. Peter	F. C. Ford	F. C. Ford	Winona, Minn.
Wisconsin Central	G. Campbell	J. L. Adams	Stevens' P't, Wis.
Worcester & Nashua	Albert Griggs.	Albert Griggs	Worcester, Mass.
Wyandotte, Kansas City & N. Western.	W. W. Brownhill		Independence, Mo.

DIRECTORY
OF
Railway Superintendents and Purchasing Agents
THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director. ‡ Ass't. Gen. Supt. § Ass't Supt.

A

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Adirondack	C. H. Ballard		Saratoga. N. Y.
Alabama Central	John M. Bridges		Selma, Ala.
Albany & Susquehanna	*C. F. Young		Honesdale, Pa.
Allegheny Valley	David McCargo	John L. Awl	Pittsburg, Pa.
Arkansas Central	James A. Tappan		Helena, Ark.
Atchison, Topeka & Santa Fe	C. F. Morse	C. F. Morse	Topeka, Kansas.
Atchison & Nebraska	L. W. Towne		Atchison, Kan.
Atchison & Nebraska	*Geo. H. Nettleton		Kansas City, Mo.
Alabama & Chattanooga	C. H. Stanton	T. J. Carlile	Meridan, Miss.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Ashtabula, Ohio.
Atlanta & Richmond Air Line			Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	J. H. Holway	Meadville, Pa.
First Division	J. T. Odell		Meadville, Pa.
Second Division	A. L. Dunbar		Meadville, Pa.
Third and Fourth Division	T. A. Phillips		Galion, Ohio.
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage.	W. H. Patriarche.	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.

B

Baltimore & Ohio	Thos. R. Sharp	Benj. Williams	Baltimore, Md.
Ohio & Chicago Divisions	W. C. Quincy		Columbus, Ohio.
Baltimore & Potomac	Geo. C. Wilkins.	A. W. Sumner.	Baltimore. Md.
Bangor & Piscataquis	M. H. Angel	L. H Eaton	Bangor, Maine.
Boston, Barre & Gardner	I. N. Ross		Worcester, Mass.
Boston & Albany	*Wm. Bliss.		Boston, Mass
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & Providence	A. A. Folsom.	A. A. Folsom.	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood.	Chas. Brigham.	Fitchburg, Mass.
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A Dodge.	Lyon & Vose.	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood.	Boston, Mass.
Boston, Lowell & Nashua	W. M. Parker.	F. H. Nourse.	Boston, Mass.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Brunswick & Albany	C. L. Schlatter		Brunswick, Ga.
Burlington & Missouri River (in Neb.)	Wm. Irving		Omaha, Neb.
Burlington, Cedar Rapids & Minnesota	W W. Walker	S. L. Dows.	Cedar Rapids, Ia.
Burlington & South-Western	R. T. Hosford	O. W. Owen.	Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	David McCargo	N. M. Whitside	Pittsburg, Pa.

C

Cairo & St. Louis	J. L. Hinkley	C. Ritsema	St. Louis, Mo.
Cairo & Vincennes	Henry L. Morrill		Cairo, Ill.
Camden & Atlantic	F. A. Lister	J. L. Wendell	Camden, N. J.
Canada Central, Brockville, & Ottawa	H. P. Alden		Brockville, Can.
Canada Southern	W. K. Muir		St. Thomas, Ont.
Canada Southern	W. Snyder	E. W. Porter	St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman.	C. W. Chapman.	Catasauqua, Pa.
Cayuga Lake	J. L. Grant		Ithaca, N. Y.
Central Branch Union Pacific	W. F. Downs	W. F. Downs	Atchison, Kan.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Central Pacific	‡John Corning		Sacramento, Cal.
Western Division	E. C. Fellows		Lathrop, Cal.
Visalia Division	E. C. Fellows		Lathrop, Cal.
Truckee Division	Frank Free		Wadsworth, Nev.
Humboldt Division	R. S. Matteson		Carlin, Nevada.
Oregon Divison	J. A. Fillmore		Sacramento, Cal.
Sacramento Division	J. A. Fillmore		Sacramento, Cal.
Salt Lake Division	R. H. Pratt		Ogden, Utah.
California Pacific Division	A. D. Wilder		Vallejo, Cal.
Central Vermont	J. W. Hobart		St. Albans, Vt.
Western Division	John Schrier		Ogdensburg, N. Y.
Central & Southern Division	Ambrose Arnold		St. Albans, Vt.
Northern & Eastern Division	G. L. Stone		" " "
Rutland Division	J. Burdett		Rutland, Vt.
Harlem Extension Division	J. Burdett		Rutland, Vt.
New-London Northern	G. W. Bentley		New-London, Ct.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Atlanta Division	G. J. Foreacre		Alexandria, Va.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	W. M. S. Dunn.	J. A. Netherland.	Richmond, Va.
Eastern & Middle Division	J. L. Morrow.		Staunton, Va.
Western Division	J. E. Mallory		
Charlotte, Columbia & Augusta.	James Anderson.		Columbia, S. C.
Cheshire	R. Stewart	H. H. Stone	Keene, N. H.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt.	R. W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	J. B. Mulliken.		Escanaba, Mich.
Madison Division	C. A. Swineford.		Baraboo, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver.		Clinton, Iowa.
Western Iowa Division	John A. Head		Boone, Iowa.
Chicago & Alton.	J. C. McMullen.	A. V. Hartwell.	Chicago. Ill.
Chicago, Burlington & Quincy	R. Harris	D. B. Sibley	Chicago, Ill.
Chicago Burlington & Quincy	‡C. H Hudson		Chicago, Ill.
Eastern and Middle Division			Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division.	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota.	C. Harris	F. I. Massey	Dubuque, Iowa.
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	*Geo. S. Bowen.	James Penny	Chicago, Ill.
Chicago & Pacific	J. M. Whitman		Chicago, Ill.
Chicago & Paducah			Streator, Ill.
Chicago, Rock Island & Pacific.	Hugh Riddle.	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chicago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.
Chicago & Michigan Lake Shore	*Geo. C. Kimball.	Wm. R. Morrison.	St. Joseph, Mich.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Chicago, Danville & Vincennes	L. Pearson	J. L. Yale	Chicago, Ill.
Chicago, Milwaukee & St. Paul	*S. S. Merrill	J. J. Slocum	Milwaukee, Wis.
Chicago, Pekin & Southwestern	W. P. Sisson		Streator, Ill.
Chicago & Canada Southern	D. Edwards		Toledo, Ohio.
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.
Cincinnati, Richmond & Chicago	Lewis Williams		Cincinnati, Ohio
Cincinnati & Martinsville.	T. C. Burnside.		Franklin, Ind.
Cin., Cumberland Gap & Charleston	W. J. Taylor		Knoxville, Tenn.
Cincinnati Hamilton & Dayton	Lewis Williams.	P. Hickey	Cincinnati, Ohio.
Cincinnati, Hamilton & Indianapolis	Lewis Williams		Cincinnati, Ohio.
Cincinnati, Lafayette & Chicago	E. H. Waldron	G. G. Hadley	Lafayette, Ind.
Cincinnati, Sandusky & Cleveland	*D. W. C. Brown		Sandusky, Ohio.
Cincinnati, Sandusky & Cleveland	Chas. Howard		Springfield, Ohio.
Cleveland, Columbus, Cincinnati & Ind.	E. S Flint		Cleveland, Ohio.
Indianapolis Division	C. C Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division.	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough.	Wm. Mullins	Pittsburg, Pa.
Cleveland, Mt. Vernon & Delaware.	G. A. Jones		Mt. Vernon, Ohio.
Cleveland, Tuscarawas Val. & Wheeling.	*E. B. Thomas	W. W. Card, *Supt.*	Cleveland, Ohio.
Colorado Central	P. J. Nichols		Golden, Col
Columbus & Hocking Valley	M. M Green.		Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H.E.Chamberlin.	H. E. Chamberlin.	Concord, N. H.
Connecticut River	John Mulligan.	John Mulligan.	Springfield, Mass.
Connecticut & Passumpsic Rivers	Geo. Killey		Lyndonville, Vt
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Corning, Cowanesque & Antrim	A. H. Gorton	R. J. Burnham	Corning, N. Y.
Cumberland Valley	J. F. Boyd	J. F. Boyd	Chambersburg, Pa.
Cumberland & Pennsylvania	J. A. Millholland		Mt. Savage, Md.

D

Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	J. R. Meckling	J. R. Meckling	Sioux City, Iowa.
Davenport & St. Paul	N. H. Wood		Davenport, Iowa.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware & Hudson Canal Co.	*C. F. Young		Honesdale, Pa.
Albany & Susq. Division	C. D. Hammond		Oneonta, N. Y.
Rensselaer & Saratoga Div.	Theo. Voorhees		Troy, N. Y.
Delaware, Lackawanna & Western		G.W. B. Cushing	New-York City.
Delaware, Lackawanna & Western	W. F. Hallstead.		Scranton, Pa.
Lack. & Bloomsburg Div.	D. T. Bound		Kingston, Pa.
Morris & Essex Division	Andrew Reasmer		Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus Division	W. F. Hallstead		Utica, N. Y.
Denver & Rio Grande	W. W. Borst	W. S. Jackson	Denver, Col.
Detroit and Milwaukee	S. R.Callaway	John S. Lorimer	Detroit, Mich.
Detroit, Hillsdale & Southwestern	W. F Parker.		Ypsilanti, Mich.
Detroit, Eel River & Illinois	A. B. Southard		Logansport, Ind.
Detroit, Lansing & Lake Michigan	J. B. Mulliken	C. D. Childs.	Detroit, Mich.
Dorchester & Delaware	J. M Murphy		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer.	C. V DeForest	Fredonia, N. Y.
Dubuque & South-Western.	J. P. Farley		Dubuque, Iowa
Dutchess & Columbia	C. L. Kimball		Dutchess J'n, N. Y.

E

East Alabama & Cincinnati	B Boyle		Opelika, Ala.
East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern	Geo. Bachelder		Boston, Mass.
Eastern & Maine Central	*C. F. Hatch	C. W. Pratt	Boston, Mass.
Erie & Pittsburg	J. M. Kimball		Erie, Pa
Erie Railway,	E. S. Bowen	C. H. Bowman	New-York City.
Erie	P. P. Wright		Jersey City, N. J.
Eastern Division	E. O. Hill		Port Jervis, N. Y.
Delaware Division	Benj. Thomas		Port Jervis, N. Y.
Rochester Division	M. E. Brown		Rochester, N. Y.
Susquehanna Div.	C. W. Gardner		Elmira, N. Y.
Buffalo Division	R. G. Taylor		Buffalo, N. Y.
Western Division	J. S. Beggs		Buffalo, N. Y.
Erie & Pittsburg	*J. D. Layng	Wm. Mullins	Pittsburg, Pa.
European & North-American	M. H. Angell	M. H. Angell	Bangor, Maine.
Evansville & Crawfordsville	John E. Martin		Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.

F

Fitchburg	Chas.L.Heywood.	John Adams	Boston, Mass.
Vermont & Mass. Div.	C. H. Comee		Fitchburg, Mass.
Flint & Pere Marquette	Sanford Keeler		East-Saginaw,Mich.
Flushing & North-Side	I. D. Barton		Hunter's Point,L.I.
Flushing & North-Side		A. E. Godeffroy	New-York City.
Fort Wayne, Jackson & Saginaw	D. W. Smith		Jackson, Mich.
Fort Wayne, Muncie & Cincinnati	W. W. Worthington		Fort Wayne, Ind.

G

Galveston, Harrisburg & San Antonio	Hardy Eddins	J. W. Pierce.	Galveston, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Geneva, Ithaca & Athens	R. A. Packer		Ithaca, N Y.
Georgia	S. K. Johnson	John Vaughn	Augusta, Ga.
Gilman, Clinton & Springfield	D. H. Conklin		Springfield, Ill.
Grand Gulf & Port Gibson	G. W. McGinnis		Port Gibson, Miss.
Grand Rapids & Indiana.	Wm. O. Hughart		Grand Rapids, Mich.
S. Division	J. M. Matheany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich.
Grand Rapids & Indiana	*W. O. Hughart		Grand Rapids, Mich.
Grand Trunk	*J. Hickson	John Taylor	Montreal, Canada
East Division	Henry Bailey		Montreal, Canada.
West Division	W. J. Spicer		Toronto, Canada.
Grand Tower and Carbondale		Wm. W. Harris	Grand Tower, Ill.
Great Southern of Ga. & Fla	M. H. Alberger		Jacksonville, Fla.
Great Western (Canada)	Andrew Watson	Robert Beatty	Hamilton, Ont.
Green Bay & Minnesota	S. B. Kenrick		Green Bay, Wis.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.

H

Hannibal & St. Joseph	*R. S. Stevens	C. N. Lee / W. J. Hilton	Hannibal, Mo.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin	D. S. Draper	Bridgeport, Ct
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	C. A. Burton		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top.	Geo. F. Gage	B. A. Knight	Huntingdon, Pa.

I

Illinois Central	Jos. F.Tucker		Chicago, Ill.
Illinois Central.	*Jas. C. Clarke	O. Ott	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois Midland	D. Hitchcock	‡P. Campbell	Terre Haute, Ind.
Illinois & St. Louis	W. K. McComas		St. Louis, Mo.
Indianapolis, Bloomington & Western	C. C. Smith		Indianapolis, Ind.
Indianapolis, Bloomington & Western	Geo.B. Wright, Receiver		Indianapolis, Ind.
Indianapolis, Cincinnati & Lafayette	Geo.L. Barringer.	E. V. Cherry	Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna.		Indianapolis, Ind.
Indianapolis & Vincennes		Wm. Mullins.	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward.	J. W. Morse.	St. Louis, Mo.
Indianapolis, Peru & Chicago	E. C. Murphy	D. Macy.	Indianapolis, Ind.
Michigan City Division			La Porte, Ind.
Intercolonial Railway	Lewis Carvell	Sam. Watson	Moncton, N. B.
International & Great Northern	H. M. Hoxie		Palestine, Texas.

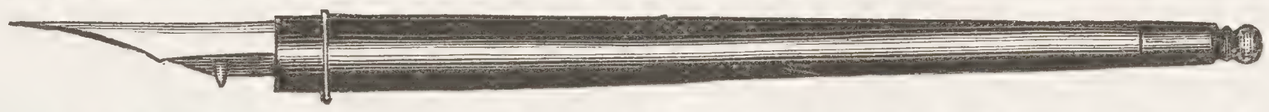
J

Jacksonville, North-Western & S. E.	E. S. Greenleaf.		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	Robert Walker		Jacksonville, Fla.
Jeffersonville, Madison & Indianapolis		Wm. Mullins	Pittsburg, Pa.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
Jeffersonville, Madison & Indianapolis	*D. W. Caldwell		Columbus, Ohio.
Jefferson, Madison & Indianapolis,	Horace Scott		Louisville. Ky.
Junction & Breakwater	Tho. Groom		Lewes, Del.
K			
Kansas Central	W. R. Martin		Leavenworth. Kan.
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard	J. F. Barnard	St. Joseph, Mo.
Kansas City, St. Joseph & Council Bluffs	*Geo. H. Nettleton		Kansas City, Mo.
Kansas Midland	W. W. Fagan		Topeka, Kan.
Kansas Pacific	O. S. Lyford		Kansas City. Mo.
Kansas Pacific	O. S. Lyford	J. L. Woods	St. Louis, Mo.
Kaw Valley Division	O. H. Dorrance		Lawrence, Kan.
Smoky Hill Division			Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col
Kentucky Central	G. H. Pendleton	Geo P. Bowler	Covington, Ky
Keokuk & Des Moines Valley	Geo. H. Griggs	G. E. Kilbourne	Keokuk, Iowa.
Knox & Lincoln	C. A. Coombs	Oliver Morse	Bath, Maine.
L			
Lackawanna & Bloomsburg	D. T. Bound		Kingston, Pa.
Lake Erie & Louisville	I. H. Burgoon		Fremont, Ohio.
Lake Ontario Shore	E. A. Van Horne		Oswego, N. Y.
Lake Superior & Mississippi	G. H. Smith	C. F. Cruft	St. Paul, Minn.
Lake Shore & Michigan Southern	Charles Paine	A. C. Armstrong	Cleveland, Ohio.
Kalamazoo Division	William Wheaton		Kalamazoo, Mich.
Leavenworth, Lawrence & Galveston	B. S. Henning		Lawrence, Kan.
Leavenworth, Lawrence & Galveston	*Geo H. Nettleton		Kansas City, Mo.
Lawrence & South-Western	R. B. Gemmell	R. B. Gemmell	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
Lehigh Valley		L. Chamberlin	Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa
Maho y Division	James I. Blakslee		Mauch Chunk, Pa.
New-Jersey Division	H. E. Packer		Bound Brook, N. J.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	T. Hartman		Little Rock, Ark.
Logansport, Crawfordsville & S. W.			Terre Haute, Ind.
Long Island	G. W. N. Custis		Hunter's Point, L. I.
Louisville & Nashville & G. Southern	Albert Fink	G. C. Breed	Louisville, Ky.
Clarksville Division	Jas. Montgomery		Bowling Green, Ky.
Memphis Division	J. T. Flynn		Memphis, Tenn.
Nashville & Decatur Division	James Geddes		Nashville, Tenn.
So. & North Ala. Division	Robert Meek		Birmingham, Ala.
Louisville, Cin. & Lexington	J. McLeod	J. McLeod.	Louisville, Ky
Louisville, New-Albany & Chicago		J. R. Parker	New-Albany, Ind.
Louisville, Paducah & Southwestern	D. F. Whitcomb	D. F. Whitcomb	Louisville, Ky.
M			
Macon & Brunswick	John A. Grant		Macon, Ga.
Maine Central	*Chas. F. Hatch		Boston, Mass.
Maine Central	Payson Tucker		Portland, Me.
Manchester & Lawrence	H. E. Chamberlin		Concord, N. H.
Marietta & Cincinnati	W. W. Peabody	S. L. Campbell	Cincinnati, Ohio.
Marietta, Pittsburg & Cleveland	Jas. McArthur	R. B. Hoover	Marietta, Ohio.
Marquette, Houghton & Ontonagon	*Samuel Schoch	Jas. S. Mott	Marquette, Mich.
Maryland & Delaware	J. L. Caldwell	J. L. Caldwell	Easton, Md.
Memphis, Carthage & North-Western	E. H. Brown		Carthage, Mo.
Memphis & Little Rock	W. E. Smith	W. E. Smith	Memphis, Tenn.
Memphis & Charleston	W. J. Ross		Memphis, Tenn.
Michigan Central	W. B. Strong		Chicago, Ill.
Michigan Central	‡J. R. Ledyard	Allan Bourn	Detroit, Mich.
Grand River Valley Division	C. B. Bush		Jackson, Mich.
Air-Line, So. Bend & Joliet	E. C. Brown		Jackson, Mich.
Bay City Division	T. B. Sargent	D. A. Waterman	Detroit, Mich.
Jackson. Lansing & Saginaw Div.	C. B. Bush		Jackson, Mich.
Mackinaw Division	T. B. Sargent		Bay City, Mich.
Michigan Lake Shore	D. P. Clay, *receiver*		Grand Rapids, Mich.
Midland Railway of Canada	H. G. Taylor		Port Hope, Ont.
Midland Pacific	J. N. Converse	M. A. Showers	Nebraska City, Neb.
Milwaukee, Lake Shore & Western	H. G. H. Reed		Milwaukee, Wis.
Mineral Point	G. W. Cobb	G. W. Cobb	Mineral Point, Wis.
Mineral Range	J H. Macdonald		Hancock, Mich
Mississippi & Tennessee	M. Burke	M. Burke	Memphis, Tenn.
Mississippi Valley & Western	Guy Wells		Quincy, Ill.
Missouri, Iowa & Nebraska	Col. Henry Hill		Warsaw, Ill.
Missouri, Kansas & Texas	A. B. Garner	G. M. Babcock	Sedalia, Mo.
Cherokee Division	L. H. Sheldon		Parsons, Kansas.
Choctaw Division	S. G. Eddy		Dennison, Texss.
Missouri Division	J. J. Frey		Sedalia, Mo.
Sedalia Division	J. J. Frey		Sedalia, Mo.
Neosho Division	L. H. Sheldon		Parsons, Kansas.
Osage Divsion	C. M. Sheafe		Holden, Mo.
Missouri Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Missouri River, Fort Scott & Gulf	B. S. Henning	A. H. Campbell	Kansas City, Mo.
Missouri River, Fort Scott & Gulf	*Geo. H. Nettleton		Kansas City, Mo.
Mobile & Ohio	*A. L. Rives		Mobile, Ala.
Alabama Division	J. S Walker		Mobile, Ala.
Mississippi Division	E. S. Hosford		Macon, Miss.
Tenn. & Ky. Division	Cecil Fleming		Jackson, Tenn.
Mobile & Girard	W. L. Clark		Columbus, Ga.
Mobile & Montgomery	G. Jordon	G. Jordon	Montgomery, Ala.
Montgomery & Eufaula	B. Dunham	B. Dunham	Montgomery, Ala.
Morgan's Louisiana & Texas		C. A. Whitney & Co.	New-Orleans, La.
N			
Nashville, Chattanooga & St. Louis	J. W. Thomas		Nashville, Tenn.
Naugatuck	G. W. Beach		Bridgeport, Ct.
New-Brunswick & Canada	John Stewart		St. Stephens, N. B.
New-Bedford & Taunton	Warren Ladd		New-Bedford, Mass.
New-Haven & Derby	E. S. Quintard		New-Haven, Ct.
New-Haven & Northampton	C. N. Yeamans	C. N. Yeamans	New-Haven, Ct.
New-Haven, Middletown & Willimantic	W. A. Waterbury	W. A. Waterbury	Middletown, Ct
New-Jersey & New-York	W. D. Beasley		Jersey City, N. J.
New-Jersey Midland	W. E Lewis	R. H. Chipman	Wortendyke, N. J.
New-Jersey Southern	*W. S. Sneden		Long Branch, N. J
New-Orleans & Selma	T. H. Du Puy		Selma, Ala.
New-Orleans, St. Louis & Chicago	*E. D. Frost	S. H. Edgar, V. P.	New-Orleans, La.
New-Orleans & Mobile	D. B. Robinson	John J. Howell	Mobile, Ala.
New-York & Harlem	Chas. M. Bissell	R. C. Moore	New-York, N. Y.
New-York, New-Haven & Hartford	E. M. Reed	R. N. Dowd	New Haven, Ct.
N. Y. & N. H. Division	John T. Moody		New-York, N. Y.
Hartford Division	C. S. Davidson		Hartford, Ct.
Shore Line Division	W. H. Stephenson		New-Haven, Ct.
New-York, Boston & Montreal	C. L. Kimball		Dutchess Jn., N. Y.
New-York Central & Hudson River	J. Tillinghast		Albany, N. Y.
Hudson River Division	J. M. Toucey	C. V. DeForest	New-York.
Eastern Division	Zenas C. Priest		Utica, N. Y.
Syracuse & Rochester Division	G. H. Burrows		Syracuse, N. Y.
New-York & New-England	H. M. Britton	W. W. McKim	Boston, Mass.
Worcester Division	P. St. M. Andrews		Worcester, Mass.
New-York & Oswego Midland			New-York, N. Y.
New-Jersey Division	G. W. N. Custis		Jersey City, N. J.
Middle Division	H. M. Flint		Middletown, N. Y.
Western Division			Oswego, N. Y.
New-York, Kingston & Syracuse	F. J. Hecker		Rondout, N. Y.
New-York, Providence & Boston	A. S. Matthews	A. S. Matthews	Stonington, Ct.
New Brunswick	Tho. Hoben	W. R. Logan	Fredericton, N.B.
Northern Pacific	*C. W. Mead	E. F. Williams	St. Paul, Minn.
Minnesota Division	J. H. Sullivan		Brainerd, Minn.
Northern Pacific Division	*J. W. Sprague		Kalama, W. T.
Lake Superior & Miss. Division	George H. Smith		St. Paul, Minn.
North-Pennsylvania	S. W. Roberts	F. A. Cornby	Philadelphia, Pa.
Northern Canada	†F. W. Cumberland		Toronto, Can.
Northern Central	*Frank Thomson	A. W. Sumner	Philadelphia, Pa.
Northern (New-Hampshire)	George E. Todd		Concord, N. H.
North-Eastern (South-Carolina)			Charleston, S. C.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
O			
Ohio & Mississippi	*A. N. Chrystie		St. Louis, Mo.
Oil Creek & Alleghany River	C. J. Hepburn		Pittsburg, Pa.
Old Colony	J. R. Kendrick		Boston, Mass.
Omaha & North-Western	J. E. House		Omaha, Neb.
Oregon & California	J. Brandt, Jr.		Portland, Oregon.
P			
Paducah & Memphis	M. Burke		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Paris & Danville	B. F. Matthius		Danville, Ill.
Passumpsic	G. A. Merrill		Lyndonville, Vt.
Pennsylvania	G. Clinton Gardner		Altoona, Pa.
Pennsylvania	*Frank Thomson	Enoch Lewis	Philadelphia, Pa.
New-Jersey Division	F. Wolcott Jackson		Jersey City, N. J.
Philadelphia Division	W. F. Lockard		Philadelphia, Pa.
Middle Division	J. N. McCrea		Harrisburg, Pa.
Pittsburg Division	Rob't Pitcairn		Pittsburg, Pa.
Tyrone Division	S. S. Blair		Tyrone Pa.
Bedford Division	S. M. Prevost		Bedford, Pa.
West Pennsylvania Division	J. McC. Creighton		Allegheny City, Pa.
Pennsylvania & New-York Canal	A. Mitchell		Wilkesbarre, Pa.
Pensacola & Louisville	C. S. Williams		Pensacola, Fla.
Peoria & Rock Island	John R. Hilliard		Peoria, Ill.
Peoria & Rock Island	*W. R. Hamilton	W. R. Hamilton	Peoria, Ill.
Peoria, Pekin & Jacksonville	John Allen	John Allen	Pekin, Ill.
Petersburg	R. A. Bacon	W. P. Taylor	Petersburg, Va.
Philadelphia & Reading	J. E. Wootten	W. S. Wilson	Philadelphia, Pa.
Catawissa & Williamsport Br'ch	D. C. Reinhart		Williamsport, Pa.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Lebanon & Tremont	H. W. Tracy		Pine Grove, Pa.
Philadelphia and Baltimore Central	Henry Wood	Henry Wood	Philadelphia, Pa.
Philadelphia & Erie	W. A. Baldwin		Williamsport, Pa.
Philadelphia & Erie		Enoch Lewis	Philadelphia, Pa.
Western Division	J. W. Reynolds		Erie, Pa.
Middle Division	Edmund L. Tyler		Renovo, Pa.
Eastern Division	Thomas Gucker		Williamsport, Pa.
Philadelphia, Wilmington & Baltimore	H. F. Kenney		Philadelphia, Pa.
Pithole Valley	J. T. Odell		Pithole City, Pa.
Pittsburg, Cincinnati & St. Louis		Wm. Mullins	Pittsburg, Pa.
Pittsburg, Cincinnati & St. Louis	*D. C. Caldwell		Columbus, Ohio.
Eastern Division	J. H. Barrett		Pittsburg, Pa.
Little Miami Division	J. D Ellison		Cincinnati, Ohio.
Western Division	Jas. R. Shaler		Dennison, Ohio.
Pittsburg, Washington & Baltimore	E. K. Hindman		Connellsville, Pa.
Pittsburg, Ft. Wayne & Chicago	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Eastern Division	George Webb		Pittsburg, Pa.
Western Division	C. D. Gorham		Fort Wayne, Ind.
Port Royal	R. G. Fleming		Augusta, Ga.
Portland & Ogdensburg	J. Hamilton	John E. Donnell	Portland, Maine.
Portland & Rochester	J. M. Lunt	W. H. Turner	Portland, Maine.
Portsmouth, Great Falls & Conway	J. W. Sanborn		Portsmouth, N. H.
Portsmouth	H. E. Chamberliu		Concord, N. H.
Poughkeepsie, Hartford & Boston	J. A. Perkins	A. W. Cable	Poughkeepsie, N. Y
Providence & Worcester	W. D. Hilton	W. D. Hilton	Providence, R. I.
Providence, Warren & Bristol	Waterman Stone		Providence, R. I.
Q			
Quincy, Alton & St. Louis	N. J. T. Dana	N. J. T. Dana	Quincy, Ill.
Quincy, Missouri & Pacific	J. R. Buchanan		Quincy, Ill.
R			
Raleigh & Gaston	A. B. Andrews	A. B. Andrews	Raleigh, N. C.
Richmond, York River & Chesapeake	H. T. Douglas	Hugh Graham	Richmond, Va.
Richmond & Danville	T. M. R. Talcott		Richmond, Va.
Richmond, Fred. & Potomac	E. T. D. Myers	T. L. Courtney	Richmond, Va.
Richmond & Petersburg	Augustus Shaw		Richmond, Va.
Rockford, Rock Island & St. Louis	W. H. Ferry, Receiver	A. E. Lyford	Rock Island, Ill.
Northern Division	Henry Looseley		Rock Island, Ill.
Southern Division	Geo. L. Walker		Beardstown, Ill.
Rome, Watertown & Ogdensburg	J. W. Moak		Watertown, N. Y.
S			
St. Lawrence & Ottawa	R. Luttreil		Prescott, Can.
St. Joseph & Denver City	*L. D. Tuthill		St. Joseph, Mo.
St. Paul & Pacific	E. Q. Sewell	E. C. Becker	St. Paul, Minn.
St. Paul & Sioux City	J. F. Lincoln	J. F. Lincoln	St. Paul, Minn.
St. Louis, Alton & Terre Haute	W. G. Broughton		St Louis, Mo.
St. Louis, Iron Mountain & Southern	Arthur W. Soper	W. S. Cuddy	St. Louis, Mo.
St. Louis, Iron Mountain & Southern	*A. W. Soper		St. Louis, Mo.
St. Louis & South-Eastern	*E. F. Winslow	A. G. Thompson	St. Louis, Mo.
St. Louis Division	George S. Winslow		Mt. Vernon, Ill.
Nashville Division	R. H. G. Minty		Henderson, Ky.
St. Louis, Kansas City & Northern	W. R. Arthur	R. W. Green	St. Louis, Mo.
St Louis Division	W. H. Vaughan		St. Louis, Mo.
Western Division	C. L. Dunham		Kansas City, Mo.
St. Louis, Vandalia, Terre Haute & Ind.	John E. Simpson	C. R. Peddle	Indianapolis, Ind.
St. Louis, Lawrence & Western	E. C. Devereaux		Lawrence, Kan.
St. Louis, Salem & Little Rock	J. W. Blanchard	H. A. Crawford	St. Louis, Mo.
Sacramento Valley & P. & S. V.	F. A. Bishop		Sacramento, Cal.
Saginaw Valley & St. Louis	N. M. Merrill.	N. M. Merrill.	Saginaw, Mich.
San Francisco & Northern Pacific	A. A. Bean	F. H. Gudes	Petaluma Cal.
San Rafael & San Quentin.	David Nye		San Rafael, Cal.
Savannah & Charleston	C. S. Gadsden		Charleston, S. C.
Seaboard & Roanoke		E. G. Ghio	Baltimore, Md.
Selma, Marion & Memphis	E. W. Rucker	E. W. Rucker	Marion, Ala.
Selma, Rome & Dalton	M. Stanton		Selma, Ala.
Sheboygan & Fond du Lac	L. A. Emerson	L. A. Emerson	Fond du Lac, Wis.
Shenango & Allegheny	I. T. Blair		Greenville, Pa.
Sioux City & Pacific	L. Burnett	L. Burnett	Missouri Valley, Ia.
Sodus Point & Southern	H. Van Vleck		Sodus Point, N. Y.
South-Shore	J. R. Kendrick.		Boston, Mass.
South Carolina	S. S. Solomon	A. Mitchell	Charleston, S. C.
Southern Central	Jas. G. Knapp		Auburn, N. Y.
Southern, of Long Island	I. D. Barton		Hunter's Point, L.I.
Southern, of Long Island		A. E. Godeffroy	New-York City.
Southern Minnesota	W. C. Van Horne.		Wells, Minn.
Southern Pacific of California	A. N. Towne		Sacramento, Cal.
North Division	A. C. Bassett		San Francisco, Cal.
Los Angeles Division	E. E. Hewitt		San Francisco, Cal.
Southwestern of Georgia	Virgil Powers		Macon, Ga.
Spartanburg & Union	W. W. Davies.		Spartanburg, S. C.
Springfield Athol & Northeastern	John W. Phelps		Springfield, Mass.
Springfield & North-Western	*A. J. Ware		Pekin, Ill.
Staten Island	J. W. Wilbur		New-York, N. Y.
Stockton & Ione	W. G. Miller		Stockton, Cal.
Stonington & Providence	A. S. Mathews	A. S. Mathews	Stonington, Ct.
Sullivan & Erie	Wm. Stevenson		Towanda, Pa.
Summit County	W. M. Riter		Coalville, Utah.
Syracuse Northern	J. W. Moak		Syracuse, N. Y.
Syracuse, Binghamton & New-York	T. Voorhees		Syracuse, N. Y.
T			
Tennessee & Pacific	George Maney		Nashville, Tenn.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	Geo. H. Noble		Marshall, Texas.
Tioga	L. H. Shattuck		Blossburg, Pa.
Toledo, Peoria and Warsaw	A. L. Hopkins, *Receiver*		Peoria, Ill.
Western Division	David K. Smith		Peoria, Ill.
Western Division	William E. Dorwin		Warsaw, Ill.
Toledo, Wabash & Western	Robert Andrews	J. T. Sterling	Toledo, Ohio.
Eastern Division	K. H. Wade		Lafayette, Ind.
Western Division	C. W. Bradley		Springfield, Ill.
Toledo, Canada Southern & Detroit	D. Edwards		Toledo, Ohio.
Troy & Boston	C. W. Moseley		Troy, N. Y.
Toronto, Grey & Bruce	N. Weatherston	W. Watson	Toronto, Can.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
Toronto & Nipissing	J. C. Bailey		Toronto.
Tuckerton	J. Naramore		Tuckerton, N. J.
U			
Union Pacific	S. H. H. Clarke	S. H. H. Clarke	Omaha, Neb.
Mountain Division	S. J. Nichols		Cheyenne, Wyom'g.
Laramie Division	S. T. Shankland		Laramie, Wyoming.
Western Division	O. H. Earll		Evanston, Wyoming.
Utah Central & Southern	John Sharp	S. H. Hill	Salt Lake City
Utica & Black River	J. F. Maynard		Utica, N Y.
Utica, Ithaca, & Elmira	H. P. Goodrich		Ithaca, N. Y.
V			
Vicksburg & Meridian	E. F. Raworth		Vicksburg, Miss.
Virginia & Truckee	H. M. Yerington	C. P. Mason	Carson, Nevada.
W			
Washington & Ohio	R. H. Havener	Lewis McKenzie	Alexandria, Va.
Wash. City Va. Mid. & G. Southern	*G. J. Foreacre		Alexandria, Va.
Welland	William Pay		St. Catherine, Ont.
Westchester & Philadelphia	Henry K. Smith	J. J. Bryant	Philadelphia, Pa.
West-Wisconsin	W. G. Swan		Hudson, Wis.
West-Jersey	W. J. Sewell		Camden, N. J
Western of Alabama	Chas. P. Ball		Montgomery, Ala.
Western of North-Carolina	John M. Rose		Fayetteville, N. C.
Western & Atlantic			Atlanta, Ga.
Western Maryland	*J. M. Hood		Baltimore, Md.
Western Union	D. A. Olin		Racine, Wis.
Wilmington & Western	David Connell		Wilmington, Del.
Wilmington, Columbia & Augusta	James Anderson	James Anderson	Wilmington, N. C.
Wilmington & Weldon	J. F. Devine		Wilmington, N. C.
Winona & St. Peter	S. Sanborn		Madison, Wis.
Winona & St. Peter		R. W. Hamer	Chicago, Ill.
Wisconsin Central	E. B. Phillips		Milwaukee, Wis.
Worcester & Nashua	C. S. Turner	C. S. Turner	Worcester, Mass.
Wyandotte, Kansas City & N. Western	W. Y. Carlton		Independence, Mo



HAWKES' PATENT FOUNTAIN PEN-HOLDER.

Fits any Pen. Rubber, $2, $2.50, $3.50, and $4.

GEO. F. HAWKES, 66 Nassau Street, New-York.

Noyes' Patent Liquid Cooler and Packing.

For Cooling Railroad Car and Steamboat Journals, and Bearings of all kinds, and for Mixing with other Oils.



The attention of those who are running heavy journals is respectfully invited to the above Liquid Cooler. It has been successfully used for upward of two years, and is constantly growing in favor, as its merits become known, and we are confident that practical men can not fail of being convinced that our preparation deserves their candid attention. What we claim for it is:

That it will Cool a Hot Journal when in Motion,

and extinguish the flame when the box is on fire; that its use will, in a great measure, prevent the occurrence of a hot journal, and save the expense, delays, and annoyances incident thereto; that it will eliminate the heat from a journal at a temperature greatly below the point required to melt the babbitt, preventing an accumulation of heat, and by a timely application save it from destruction; that its non-inflammable elements (where waste is used) permeate the waste and prevent its taking fire; that it keeps the journal smooth and polished, preventing unnecessary friction; that its combination is based upon true scientific principles, which renders it impossible to fail in its results, and is

The only Preparation that will Cool a Hot Journal

while it is in motion, as attested by certificates below; that one thorough application on a hot journal will do more execution in cooling than the constant application of water for half an hour, besides doing it evenly and without loss of time.

Every Railroad or Steamboat

should have a can of the Liquid Packing on board, with the directions for its use pasted upon it, and thus always have at hand the means of effectually cooling a hot journal, and thereby avoid the expense, danger, and trouble from this cause.

AN EXCELLENT AND DURABLE LUBRICATOR

can also be made by combining with the Liquid Cooler and Packing certain quantities of oil, according to the season of the year in which it is to be used, as set forth in the directions. The combination produces a soft, heavy body, that is very essential in hot weather. The Liquid also keeps oil sweet, by preventing oxidation, and its value is greatly enhanced by the additional body which it acquires; and, considering the increased durability, it will be found a matter of considerable economy to combine the Liquid and oil together.

This preparation will be found especially valuable for Steamships, and it has been a leading idea in its combination to especially adapt it for their use. There is, however, no class of machinery, where heavy bearings are used, where it can not be employed beneficially and economically.

On Railroads where Black oil is used as a lubricator exclusively, mixed as directed, especially in warm weather, it will be found a great improvement, and fully equal to lard oil, making a considerable percentage of saving in cost, lessening the liability of hot boxes; and animal oil can be entirely discarded, even in warm weather, and as good results obtained, with less expense, as where all animal oil is used.

The Liquid Cooler and Packing is put up in two forms, one for journals not using waste-packing, such as Steamships, etc., the other for journals on Railroad cars, etc. *In ordering, be particular to state which class of work it is required for.*

We manufacture suitable cans for using the LIQUID PACKING. Send for circulars containing full description and instruction for use.

WHAT RAILROAD MEN SAY OF IT.

BOSTON, LOWELL AND NASHUA R.R. SUPERINTENDENT'S OFFICE,
BOSTON, April 13, 1874.

P. NOYES, AGENT:

Dear Sir: We have been using your LIQUID COOLER AND PACKING, and consider it one of the best articles for cooling off hot boxes that we have ever been acquainted with. All of our trains are supplied with a can of it. JOHN B. WINSLOW, *Supt.*

PERSON NOYES, Esq., EAST CAMBRIDGE, MASS., March 4, 1874.

Agent Belt and Leather Stuffing Co.:

Dear Sir: In reply to your inquiry in regard to LIQUID COOLER AND PACKING, allow me to say:

I have just sent in a requisition for three barrels, which I trust you have received before this. I will only say in recommending it, that it is the best article I have ever used, and our conductors and engineers all indorse my sentiments.

I have ordered eighteen more cans, which I think will meet your approbation. I intend to have one on every train, and on long trains two, and have them made with inch nozzles, and a cap attached by chain, to prevent thickening; also a packing-iron about fourteen inches long, attached to a slot in the can, to be used in stirring up the LIQUID, and also for drawing the waste out on the front side, and crowding it in on the back side, before putting the packing in. This little packing-iron I find very essential, as it is always at hand, and will prevent delay in searching for a suitable article in times of emergency. Yours truly,

JOHN F. CROCKETT, *M. M., Boston, Lowell, and Nashua R. R.*

PERSON NOYES, Esq., CHICAGO, Dec. 10, 1873.

Agent Belt and Leather Stuffing Co.:

Dear Sir: The barrel LIQUID PACKING sent on trial is approved, and you will please send us five barrels more. Yours, H. I. HIGGINS, *Purchasing Agent C., B., and Q. R. R.*

CHICAGO, March 23, 1874.

P. NOYES, AGENT: Please forward to C., B., & Q. R. R., and send bill of same to this office, eight barrels of LIQUID PACKING AND COOLER, same as purchased of you before, and send as soon as possible. H. I. HIGGINS, *Purchasing Agent.*

AGENT BELT AND LEATHER STUFFING CO.: CHICAGO, ILL., May 7, 1874.

Dear Sir: You will please forward to the C., B., and Q. R. R. ten barrels Liquid Packing.

H. I. HIGGINS, *Purchasing Agent C., B., and Q. R. R.*

MR. NOYES: FITCHBURG, MASS., Aug. 20, 1872.

Dear Sir: I have used your LIQUID PACKING for the past four months, and am perfectly satisfied that it is the most effectual article ever in use for the purpose claimed. I have just ordered another barrel. If all railroad companies would adopt your LIQUID COOLER, I think they would find a saving of nearly 20 per cent, when used with mineral or black oil, according to your directions. JACOB MARSH, *Master Car Builder, Troy and Greenfield R. R.*

MR. P. NOYES: SALEM, MASS., Aug. 7, 1872.

Dear Sir: I have been using your LIQUID PACKING for cooling car journals, for some time past, and have been well pleased with it. I have had occasion to use it a number of times under Pullman Cars, and it has been a complete remedy in every case of hot journals.

Every train should be provided with it, as it is a saving of time and expense in the running of trains, provided it is applied and cared for according to directions for using.

J. P. SOMERBY, *M. C. B. of Eastern Railroad.*

P. NOYES, Esq: ALBANY, Nov. 1, 1872.

Dear Sir: I received the barrel of LIQUID COOLER AND PACKING you sent me for trial, and gave it out to our most experienced conductors, to use according to directions. Below please find their report:

"WE, the undersigned, Freight Conductors on the Eastern Division of the N. Y. C. & H. R. R. R., have used the LIQUID COOLER furnished by Mr. Jones, and find that when we arrive at a station with a hot journal, the LIQUID PACKING cools it sufficiently by the time we arrive at the next station to use the black oil, and then have no trouble in getting through with it. It is the best we ever used.—R. H. FISHER, A. W. GETMANS, R. H. HEATH, WM. HESS, Conductors E. Div., N. Y. C. R. R. I. FERGUSON, Conductor H. R. R. R."

JOSEPH JONES, *M. M., N. Y. C. & H. R. R. R., E. Div.*

CERTIFICATES OF NAVAL OFFICERS.

[COPY.]

BUREAU OF STEAM ENGINEERING,
NAVY DEPARTMENT,
Washington, April 12.

CHIEF ENGINEER'S OFFICE,
U. S. Navy Yard, Washington, March 30, 1875.

COMMODORE THOS. H. PATTERSON,
U. S. N., Commandant:

Sir: In obedience to your order of December 24, 1874, to test the LIQUID COOLER of Person Noyes, of Boston, Mass., and report upon the results, I respectfully submit the following:

This Liquid is a composition possessing both lubricating and cooling qualities, and when mixed with other oils, gives it more body and prevents oxidation.

The test was made upon a journal 9½ inches in diameter and 14 inches long, making seventy revolutions per minute. The journal was rough and in bad condition at the commencement of the test, and was allowed to become hot; the Liquid was applied and in a few minutes it was reduced to a good working condition. Several experiments were made, all with equally favorable results. The Liquid can be mixed with other oils, or, in extreme cases, with fresh or salt water, the latter being preferable, as it amalgamates more readily with the Liquid, which at the same time retains its lubricating qualities. It is very efficient for cooling hot journals, and the cost is about one half that of sperm oil.

The Castor Oil Belt Dressing is an excellent article for preserving belts. It protects the surface from the atmosphere, keeps them pliable, and makes them adhere closely to the pulley, and more durable. Very respectfully, your ob't serv't,

(Signed) EDWARD FITHIAN, *Chief Engineer, U. S. N.*

PERSON NOYES, AGENT: BOSTON, April 15, 1875.

Dear Sir: I have been using your LIQUID COOLER for some six months past, and can say of it that in all respects it is far superior to any thing of the kind I have ever used. After having tried many cooling mixtures, down even to cold water, upon one of our engine bearings, without success, your Cooler has worked a complete change, to our entire satisfaction. I also find that with one third of your Liquid and two thirds oil, it has the desired effect of keeping cool bearings and lubricating them perfectly at the same time. In some extreme cases it may be expedient to use more than one third of the Liquid. With what experience I have had, I find it the best article for all bearings, and use the same on all machinery in my department. Would cheerfully recommend it to all parties who have charge of machinery for economy and durability, and, both afloat and ashore, engineers will find it of great benefit to them.

I have also tried your Castor Oil Belt Dressing on my belts, and consider it the best article for softening and preserving the leather that I have ever used.

Yours, most truly,

THOS. J. MARSTON, *Navy Yard, Boston.*

P. NOYES,
Agent Belt and Leather Stuffing Co.: BOSTON, April 15, 1875.

Sir: I have had in use for some time past, your LIQUID COOLER, and having given it a thorough trial, I can say that I regard it as being the best article for cooling a hot journal that I have ever used. I have tried it on thrust bearings, which is the worst place for heat that I have on board ship, and it cooled it down splendidly. I find by mixing one part of your Cooler with about two parts lard oil that my anxiety was lessened considerably, after having it in use forty-eight hours, regarding hot bearings. By attention to mixing and stirring, it will cool down the bearing. I save about one third by mixing Liquid Cooler with lard oil. I would recommend any one to try it, both for its economy and cooling properties.

Yours, very truly,

A. MORRISON, *Chief Engineer Steamship Carroll.*

Send for a Barrel. No charge unless it does all we state.

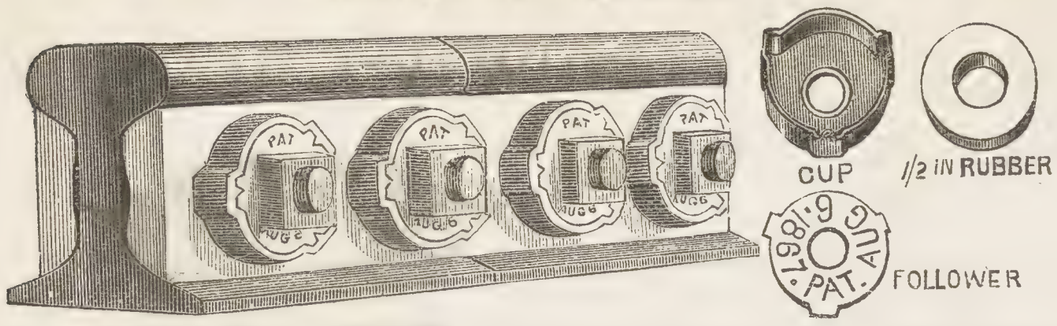
Manufactured by the Belt and Leather Stuffing Co.,

47 INDIA STREET, BOSTON.

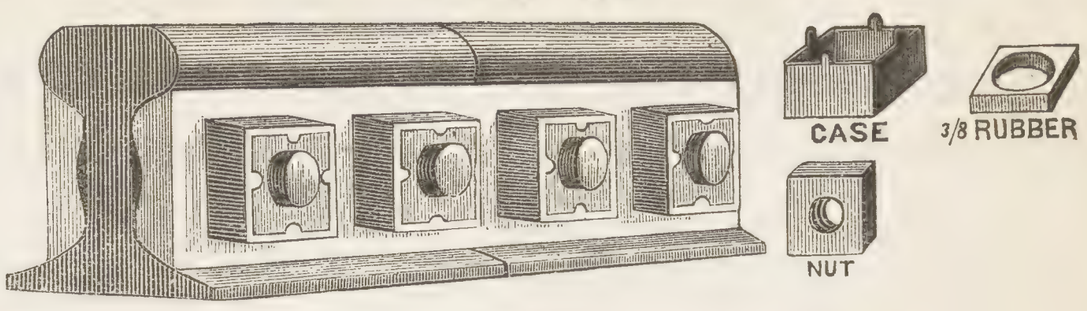
Sold by L. G. Tillottson & Co., New-York.

PRATT'S PATENT COMPENSATING FISH-PLATE JOINTS.

"SPRING CUP-WASHER."



"SPRING NUT."



Track Bolts and Nuts are constantly subjected to a vibration and jar. One large item of expense is for wrench-work and replacement of bolts and nuts already off.

Most of the contrivances for removing this trouble are failures. They do not remove the cause of the trouble. This can only be done by some elastic material, which will absorb the vibration and prevent its reaching the nuts. Experience proves that permanent elasticity can not be obtained by using wood, which is perishable, or steel, which can not be made of uniform temper. In our inventions, the elastic packing of rubber between the nut and the plate absorbs the jar or vibration, insulates the nut, and by removing the cause of the trouble removes the trouble itself. Among its advantages are these:

1st. It saves the expense of wrench-work and loss of nuts.
2d. The rubber absorbs the blow given by the wheels at the joint, in such manner as to prevent fracture of rails at the joint, and accidents resulting therefrom.
3d. The track is made noiseless.
4th. Rails are saved from pounding out at the ends, and the thread of the bolts and nuts from stripping.

The practical value of these inventions is more fully demonstrated by the two million joints now long in use.

Manufactured and Sold by

THE PRATT MANUFACTURING COMPANY,

NO. 71 BROADWAY, NEW-YORK,

Manufacturers and Dealers in all kinds of RAILWAY TRACK SUPPLIES; also, New-York Agents for the Tuttle & Whittemore Co., Naugatuck Conn., Manufacturers of REFINED MALLEABLE IRON CASTINGS, from Patterns to order.

Special attention given to MALLEABLE IRON CASTINGS for Railroad Car construction.

VOSE, DINSMORE & CO.,

Manufacturers of

RAILWAY CAR SPRINGS

OF EVERY DESCRIPTION,

INCLUDING THE "COMBINATION ELLIPTIC SPRING."

Special attention is called to our Patent **CLIFF ELLIPTIC SPRINGS** for Freight and Passenger service. See advertisement, page ii.

Steel Rails, Locomotive and Car Tires, Elliptic Springs and Cast Steel of all descriptions.

JOHN C. WYMAN, General Manager.

194 Lake Street, Chicago.
720 North Second Street, St. Louis.

32 Warren St.,
NEW-YORK.

Railroad and House Painters' Colors,

Made from the Very Best Materials and especially prepared for Painting Railroad Cars, Station-Houses or Depots, Bridges, etc., etc.

BUYERS WILL FIND IT GREATLY TO THEIR ADVANTAGE TO EXAMINE OUR PAINTS WHEN PURCHASING.

Sample Cards furnished upon application.

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NEW-YORK,

Manufacturers and Importers of White Lead, Zinc Paints, Oils, Varnishes, Glass, Putty, Whiting etc., Fine and Ordinary Colors, Dry and in Oil.

HOADLEY & PERKINS

Manufacturing Co.

COR. FRANKLIN AND CENTRE STS.

(New-Haven Railroad Freight Depot),

MANUFACTURERS OF

BRASS COCKS

For Steam, Water, and Gas.

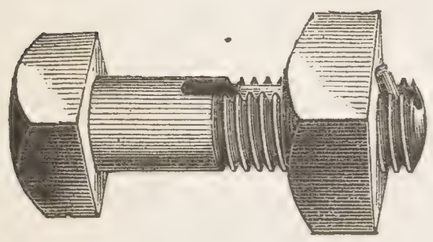
☞ *Illustrated Catalogue and Price-List furnished on application.*

WM. COURTENAY, President. CHAS. F. COBB, Secretary.

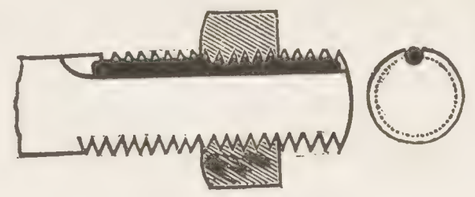
The Lock-Nut and Bolt Co., of New-York,

Office, No. 17 DEY STREET, New-York.

Manufacturers of all kinds of BOLTS, for FISH-PLATES, CARS, BRIDGES, MACHINERY, CARRIAGES, &c., with the



"CUMMING NUT-LOCK,"
Patented
June 16, 1868,
August 23, 1870.



SECTIONS.

Unequaled for CHEAPNESS, SIMPLICITY & EFFECTIVENESS.

This simple device, as will be seen by the engravings, consists of a groove being cut in the threaded part of a screw bolt into which is placed a key of copper wire, or other soft metal; when the nut is screwed on, it cuts a thread on the key, thereby making it impossible for the key to get out until the nut is taken off. When the nut is screwed up to its place, that part of the key over which the nut has passed is riveted up against the nut with a small punch, destroying the thread on the key. The nut, therefore, can not move backward until force is used, as with a wrench.

The groove can be rapidly cut with a simple machine designed for the purpose.

Experience has proved this device absolutely reliable, and it is the cheapest of all known devices for the purpose. By its use, old bolts on which the nuts have become too slack for use can be made as good as new, making it a great saving to railroad companies and others in that item alone. It is cheaper than a check-nut.

If the bolt should become slack from shrinking of timber or other causes, *the nut will always remain firmly attached to the bolt*, and, with the wrench, can be screwed up *any distance*, and the wire riveted up any number of times, or can be taken off without injury to the nut or bolt.

This is the only method in use that locks the nut firmly to the bolt without regard to place or surroundings, all others require some attachment that holds the bolt in its position, and a washer or other attachment to keep the nut from turning.

DIRECTIONS FOR USE.—Place the copper key in the slot, pointed end out, and beveled side up, in such a position that when the nut is screwed to its place about three-eighths of an inch of the key will project beyond its outer face. Then screw the nut to its place *over the key*, allowing it to cut its own thread in the copper. Then take a narrow flat set punch, and rivet the projecting part of the key *solidly* against the outer face of the nut. To tighten the nut: screw it up, and rivet the key tighter. To remove the nut: simply apply the wrench and unscrew the nut. It will cut its own way out through the copper. The same key can be used several times, by moving it outward a few threads in the slot.

DITTMAN'S

STAR NUT-LOCK.

Fig. 1

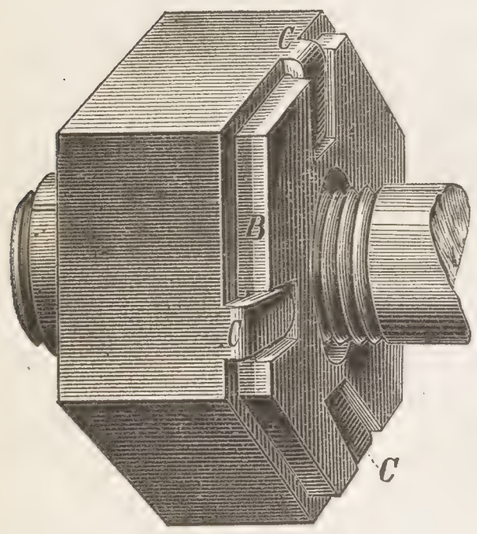
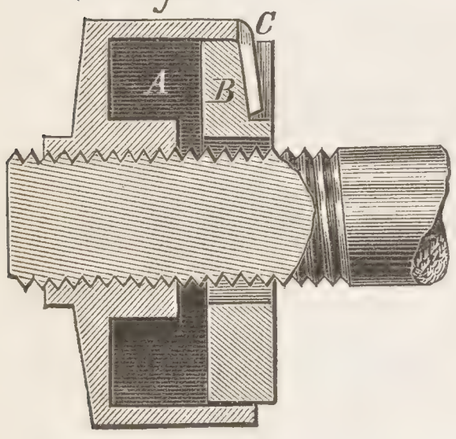


Fig. 2



Patented September 8, 1874.

The Nut-Lock herewith illustrated in perspective (Fig. 1) and section (Fig. 2) is so constructed as to prevent the backward rotation of the Nut under the influence of jars and jolts, and also to take up automatically the expansion or contraction of the bolt due to changes of temperature.

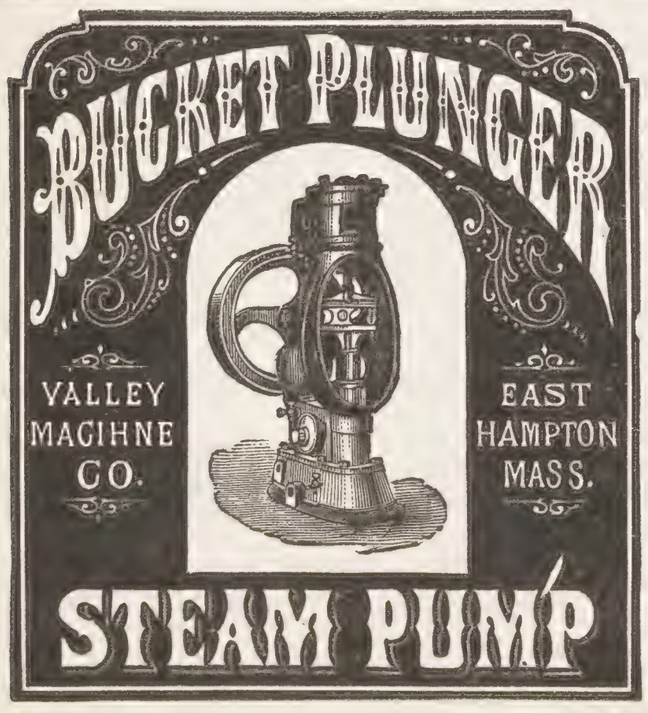
This Nut-Lock is not to be used in connection with Fish-Plates for a period of three years and five months, but for all other purposes it can be used. After that period has elapsed, it can be used with Fish-Plates.

We will guarantee the Nut-Lock not to be an infringement on any other invention. All parties infringing on our rights will be dealt with according to law.

License will be granted to manufacture the above Nut and samples furnished upon application to the

STAR NUT-LOCK CO.,

Leacock P. O., Lancaster Co., Pa.



HARRISBURG FOUNDRY

AND

Machine Company,

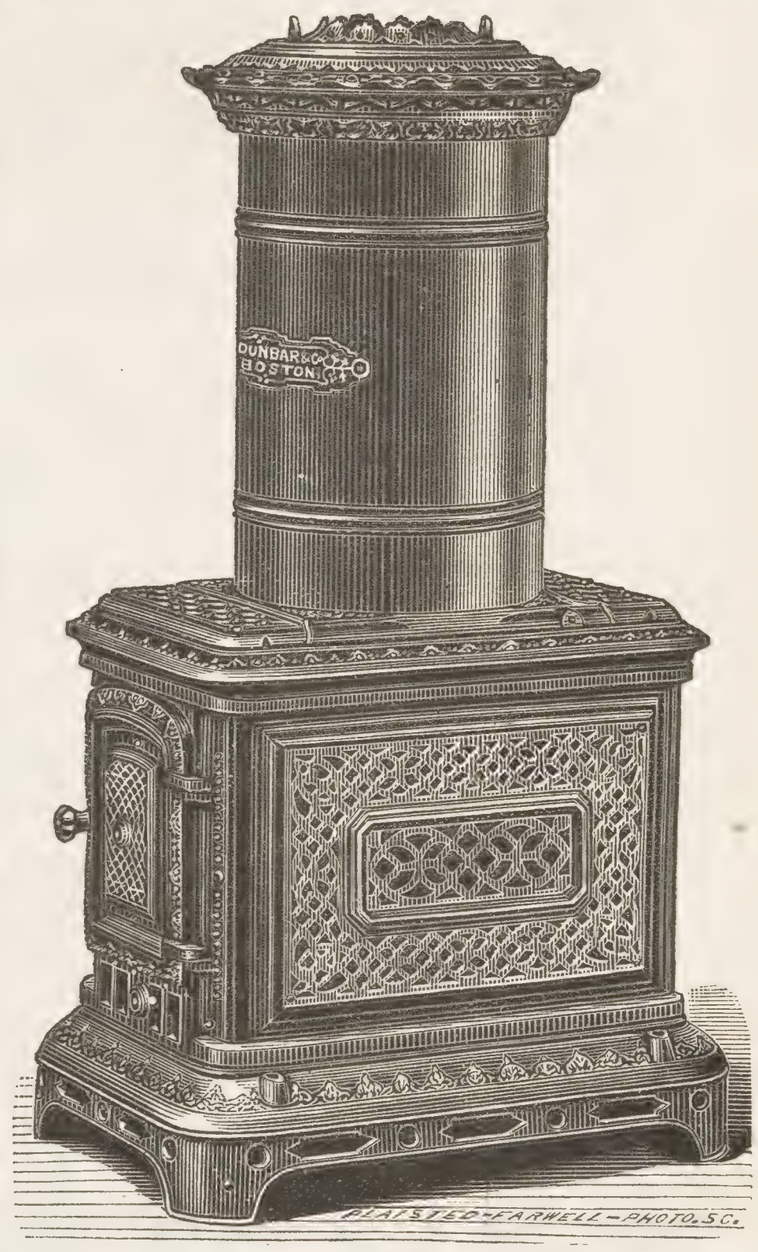
HARRISBURG, PA.

Manufacture all kinds of Machinists' and Car-Builders' Tools, for working Iron, such as Lathes, Planers, Slotting Machines, Horizontal Drilling and Boring Machines, Vertical Drills, all sizes, Shaping Machines, Bolt Cutters, Nut Tappers, Car Wheel Borers, Hydraulic Wheel Press, Axle Lathes, etc. Patent Sectional Tubular Boiler, safety and great economy at moderate cost.

Also Oil Tank Cars, Boiler and Sheet Iron work of all kinds, Foundry Cupolas, Cranes, Ladles, etc.

SAMUEL FISK, General Manager.

GEO. DUNBAR & CO.'S
Railway-Car Stove.



The above cut represents our new Railway Wood-Burning Car Stove, which for Style and Economy is unsurpassed by any in the market.

GEO. DUNBAR & CO.

Dealers in

General Railroad Supplies,

19 FEDERAL ST., BOSTON.

General Selling Agents for Boston Car-Spring Co. and Chrome Steel Co.

THE UNION WHITE LEAD MANUFACTURING COMPANY. PURE

Union White Lead Manufacturing Co.,

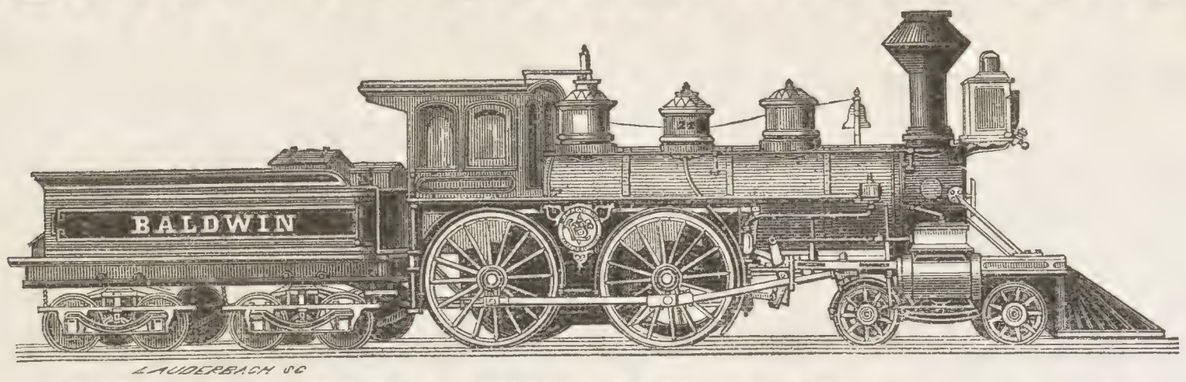
26 Burling Slip, New-York.

B. W. HOW, Secretary. JAMES HOW, President.

MANUFACTURERS OF

WHITE LEAD, RED LEAD, LITHARGE, ORANGE MINERAL.

BALDWIN LOCOMOTIVE WORKS.



BURNHAM, PARRY, WILLIAMS & CO., Philadelphia,

MANUFACTURERS OF

LOCOMOTIVE ENGINES,

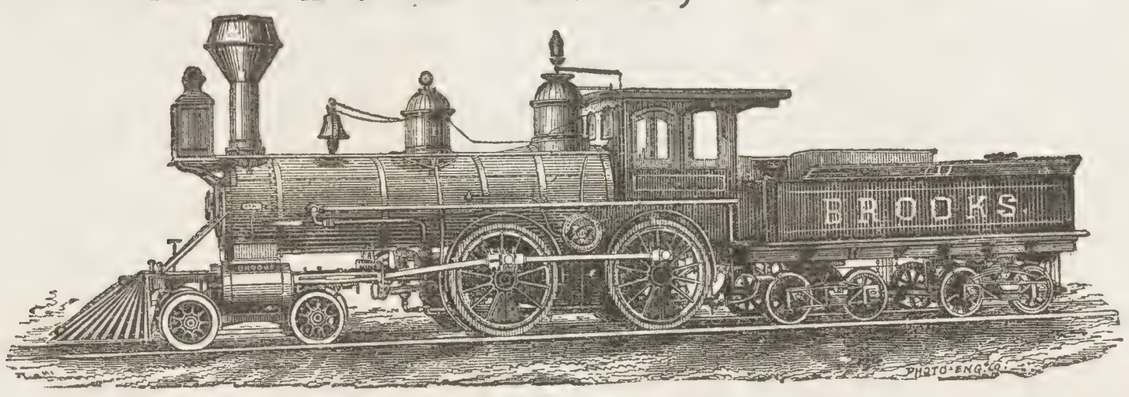
Especially adapted to every variety of Railroad use, including Mine Engines and Locomotives for Narrow-Gauge Railways.

All Work thoroughly interchangeable.

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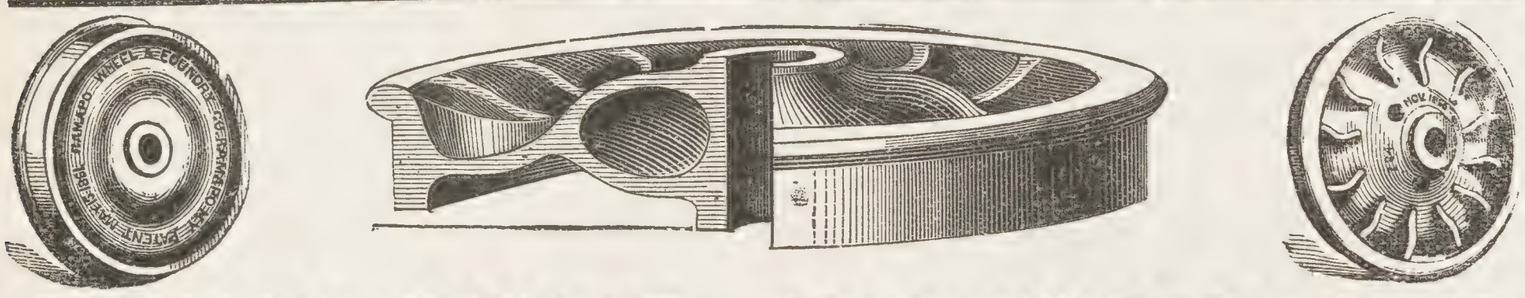
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Orders solicited for Locomotives adapted to every class of Railway service.

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Chilled Wheels for Drawing-Room and Sleeping Coaches,

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GEO. CHURCH, Pres't and Treasurer. W. W. SNOW, Sup't and Gen'l Manager.

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MACHINISTS' TOOLS

OF ALL DESCRIPTIONS

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GEO. Q. DOW, Sec'y. NEW-YORK

WE HAVE THE BEST AND MOST COMPLETE ASSORTMENT OF

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IN THE COUNTRY, COMPRISING ALL THOSE USED IN

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WE MAKE A SPECIALTY OF MANUFACTURING

GEAR WHEELS OF ALL DESCRIPTIONS,

WHICH ARE MADE ABSOLUTELY PERFECT WITH OUR

PATENT MOULDING MACHINE.

FOR PHOTOGRAPHS, PRICES, AND DESCRIPTION, ADDRESS

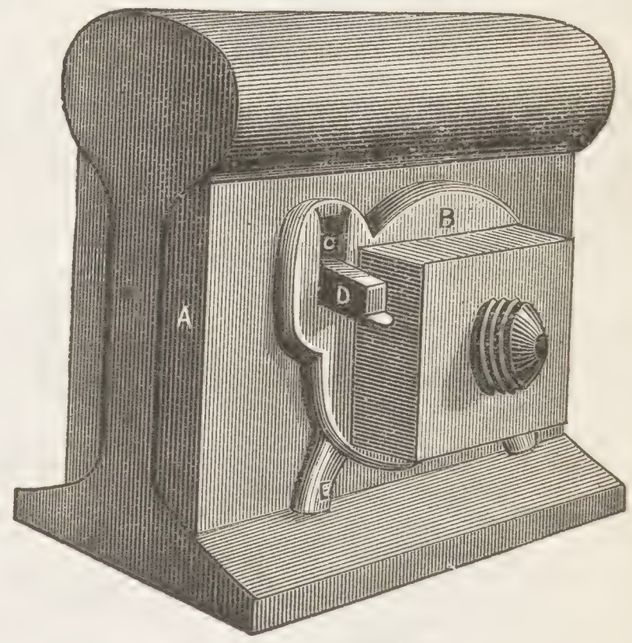
NEW-YORK STEAM ENGINE CO.,

98 CHAMBERS STREET, NEW-YORK.

PURDIE'S PATENT

Safety Washer,

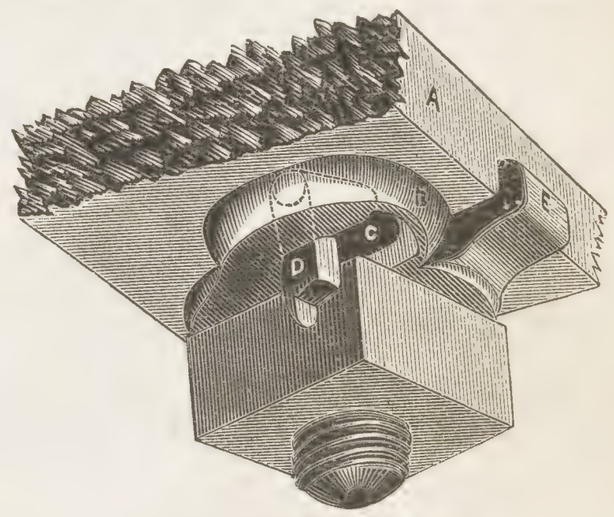
A Positive Nut-Lock, made of Malleable Iron.



For FISH PLATE.

EXPLANATION OF CUT.

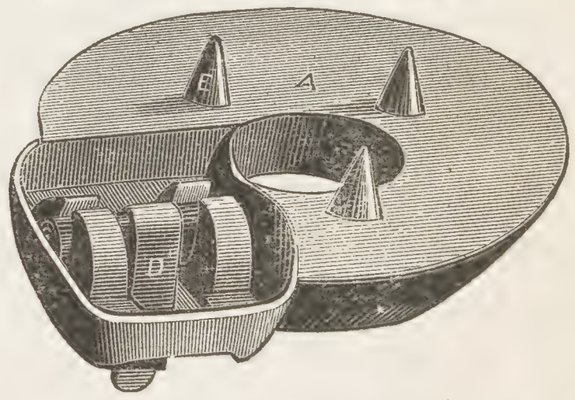
A, Fish plate. *B*, Washer, with projecting feet. *C*, Cavity, into which the dog, *D*, swings, on screwing up the nut. *D*, Pivoted dog which falls by side of nut when screwed home.



CAR TRUCK Washer.

Adapted for use on fish-plate bolts, car trucks, wagons, mowing machines, wood-work of all kinds, or for any purpose where bolts and nuts are used.

Cheap, Effective, and Durable.



Reverse side for WOOD-WORK, showing Method of Pivot Swing.

Will fit on old or new work, no alterations or special tools needed, requiring no rubber or wood for compressing or bending to hold the nut. The dog being in position to lock at any time required, by turning down by the side of the nut when screwed home; should the bolt or thread give any, so as to become loose, the dog will still hold the nut from turning back, and the nut can be screwed up as readily as by the old method.

Have been practically tested for two and a half years on many Railroads, giving unqualified satisfaction, one Railroad alone having them on over 2,500 cars

Cast-iron washers for timber or bridges furnished to any size or weight.

Samples and price-lists forwarded on application to

JOHN PURDIE,

MANAGER OF

Safety Washer Manufacturing Company,

No. 311 MAIN STREET,

BUFFALO, N. Y.

J. F. SULLIVAN,
DESIGNER AND ENGRAVER ON WOOD
No. 23 JOHN ST. NEW YORK

SOLID HEAD
NICKEL-PLATED SCREWS.
ADAMS NICKEL-PLATING and MFG. CO.
South Windham, Ct.

THE
PETERSBURG CAR COMPANY,
Petersburg, Va.,
Are now ready to receive orders for all kinds of
FREIGHT CARS.
These works are supplied with the most improved machinery, and have switch connections with broad and narrow gauge. They are prepared to furnish Rolling Stock with the utmost promptness, of the best materials and workmanship, and at the lowest prices.
T. L. H. YOUNG, President. JOHN W. FLEMING, Superintendent.

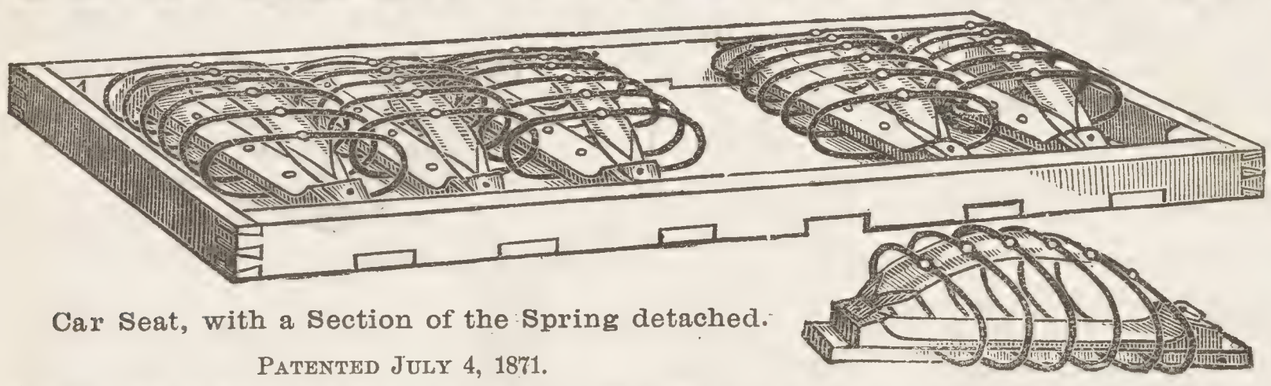
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28th Street, Pittsburgh, Pa.
Make a *Specialty of Freight Car Forgings* and *Castings* delivered to Shops. Also *Locomotive Cylinders, Frogs and Switches.* Address,
THOS. N. MILLER, President.

PLANING AND MATCHING MACHINES
UNIVERSAL WOOD WORKERS
TRADE MARK
WOOD WORKING MACHINERY.
BENTEL, MARGEDANT & CO.
HAMILTON, OHIO.
Send for Catalogue and Price List.

CRANK PLANERS.
Superior Design and Workmanship, Extra Heavy (1400 lb.)
DOWN, ANGULAR & CROSS-FEED,
TO PLANE 12x16x15.
The Hull & Belden Company, Danbury, Ct.

IRON AND STEEL
DROP FORGING.
Of Every Description, at Reasonable Prices.
The Hull & Belden Company, Danbury, Ct.

COBB'S ELLIPTIC STEEL SPRING.



Car Seat, with a Section of the Spring detached.

PATENTED JULY 4, 1871.

FOR CAR SEATS AND SPRING MATTRESSES FOR SLEEPING CARS.

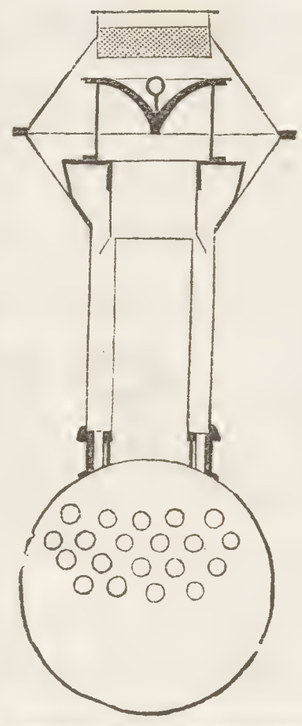
These Springs have been in successful operation on a large number of the leading railroads in the United States for over three years.

OFFICE OF PULLMAN PALACE CAR COMPANY,
CHICAGO, January 1, 1873.

Z. COBB & SONS, CHICAGO, ILL.:
GENTS: Have used your Patent Elliptic Steel Spring *exclusively* for the last three years in over **300** of our cars, and are satisfied of their superiority over all other springs in use.
A. B. PULLMAN.

Z. COBB & SONS, 292 West Adams Street, CHICAGO.
BRANCH OFFICE: Wilmington, Del.

ANTHONY ROSS & JAMES McINTOSH'S
SPARK-CONSUMING SMOKE-STACK,



For Coal and Wood Burning Locomotives.

Patented June 23, 1874.

MEMPHIS, TENN.

We are now prepared to lay before the Railroad public a Smoke-Stack, which has been used for twelve months on the Memphis and Charleston Railroad, on Passenger, Freight, and Switching Engines, carrying the most combustible article—Cotton—without any danger of Fire whatever from sparks, or annoyance to passengers.

Railroad Companies wishing to use them can be furnished with working drawings by sending size of cylinder of engines to be used upon.

For rights to use the same and full particulars, apply to

ANTHONY ROSS,
Master Mechanic,
Memphis and Charleston Railroad,
MEMPHIS, TENN.

NEW-HAVEN
CAR HEAD-LINING WORKS,
NEW-HAVEN, CONN.

In consequence of the large and increased demand for our "CAR HEAD LININGS" we have been obliged to remove our Manufactory from WORCESTER, MASS., to NEW-HAVEN CONN., where new and commodious buildings have been erected, with increased conveniences for promptly supplying our customers, and we beg to invite your attention to our new and SUPERIOR FACILITIES for furnishing

"CAR HEAD LININGS"

OF THE MOST APPROVED STYLES AND PATTERNS

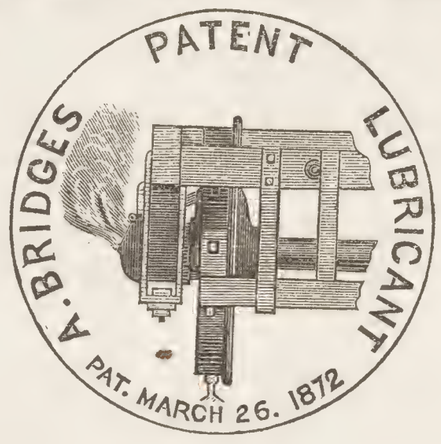
Either Full Decorated, Part Decorated, Encaustic, or Printed and Plain,

At Short Notice and in the Most Satisfactory Manner.
Orders will be received at the Factory, in New-Haven, Ct., or by

L. G. TILLOTSON & CO.,
No. 8 Dey Street, New-York,

MANUFACTURERS AND DEALERS IN RAILWAY AND TELEGRAPH SUPPLIES OF EVERY DESCRIPTION.

HOT JOURNALS ENTIRELY PREVENTED
BY THE USE OF



For Railroad Car Journals and other Bearings.

In presenting this Lubricant to the notice of Railroad and Steamboat Managers and Operators in Machinery generally, I do so with a practical knowledge of its merits, and with confidence that it will be found to possess invaluable qualities as a

Lubricator and Counteractor of Friction.

It has been in use, during the past two years, on a number of Railroads and Steamers, and is highly approved of.

Parties wishing to make a practical test of the Lubricant will be furnished with sample on application.

ALBERT BRIDGES, Patentee,
MANUFACTURER AND DEALER IN
RAILWAY SUPPLIES and MACHINERY,
No. 46 CORTLANDT STREET,
SEND FOR CIRCULAR. NEW-YORK.

Steel Stamps, Steel Letters, and Figures,
Of every description, and for all purposes.
NAME PUNCHES
For marking tools, patented articles, etc., made in the very best manner, at short notice and on reasonable terms, by
RICHARD H. ROGERS,
ENGRAVER,
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Orders by mail promptly attended to.

F. J. LAWRENCE
MANUFACTURER OF
Railroad Car Head Linings,
15 Hamilton Street,
ALBANY, N. Y.
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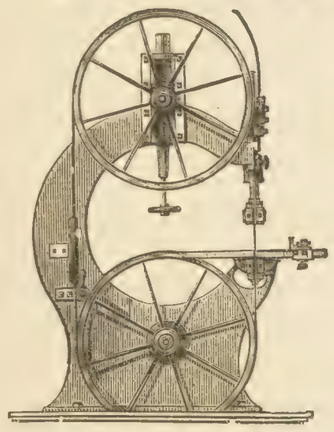
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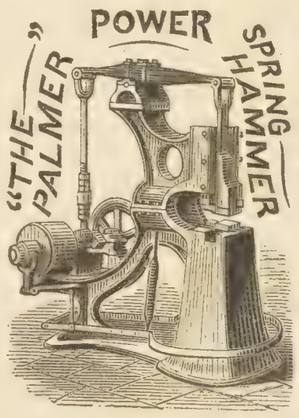
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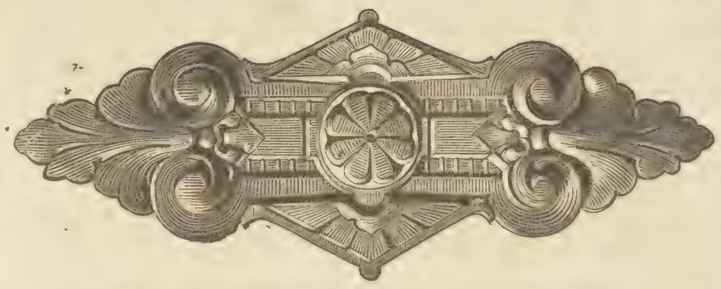
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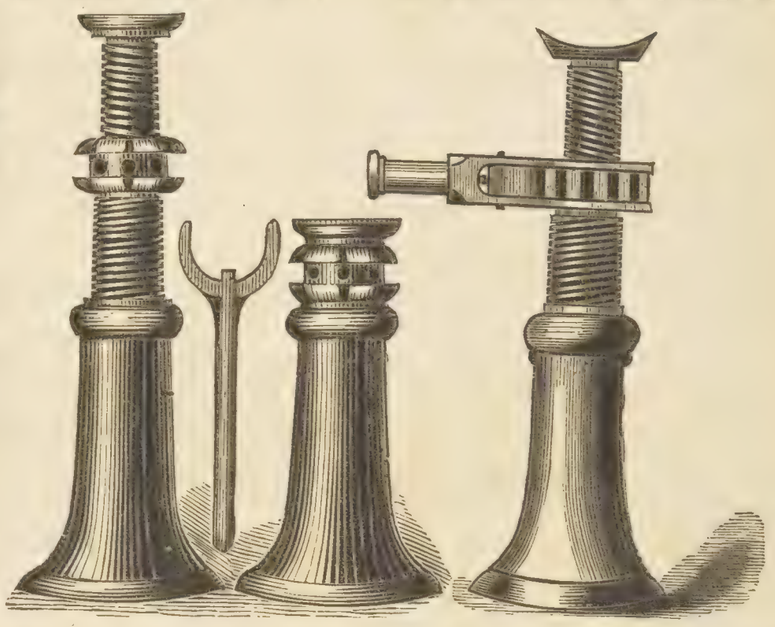
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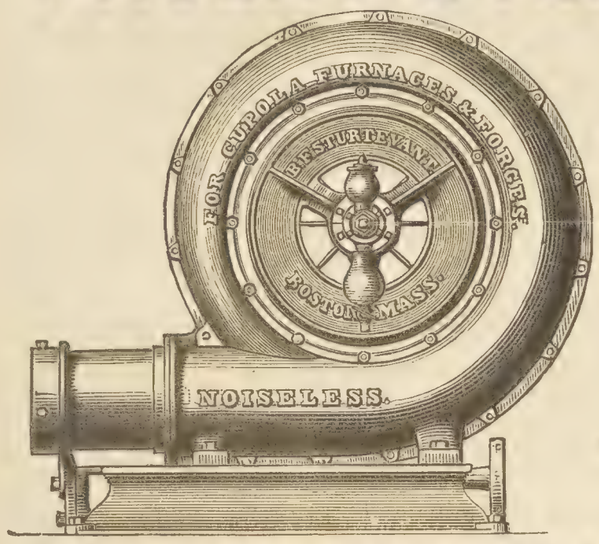
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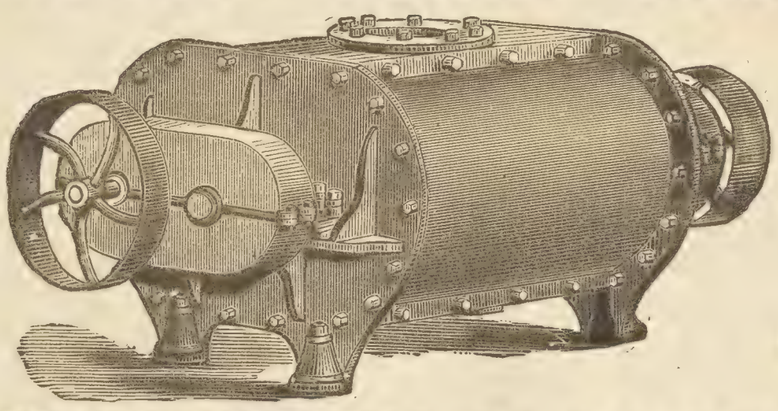
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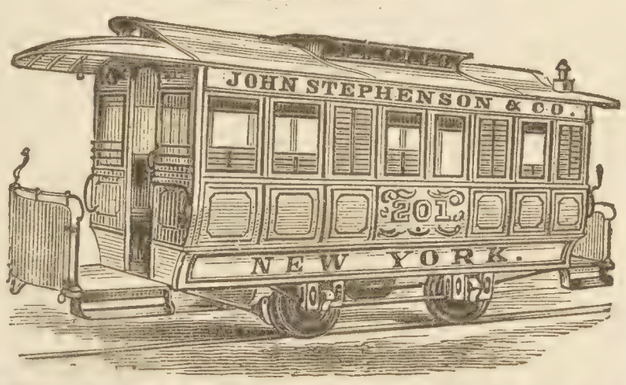
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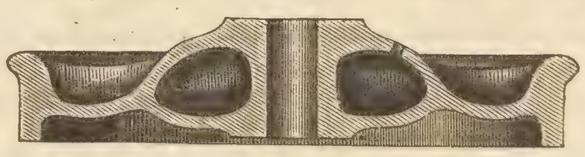


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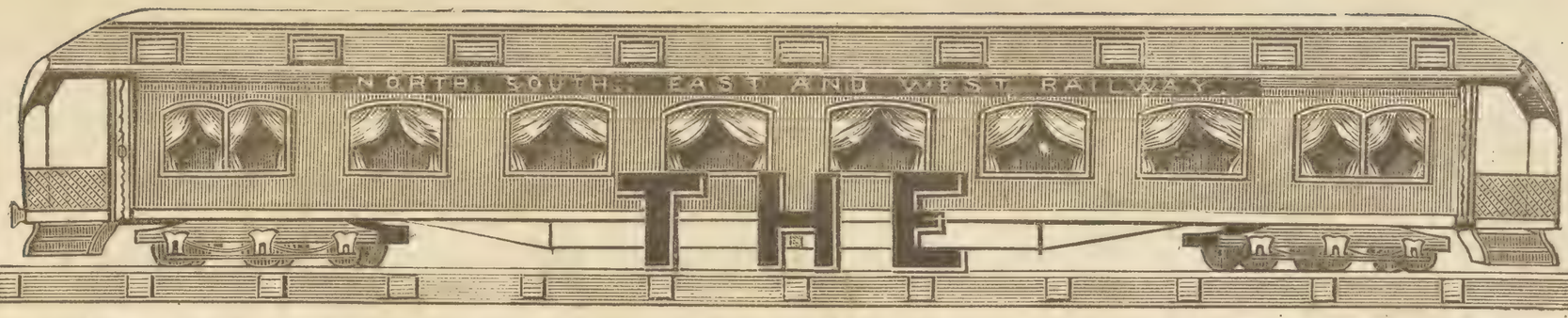
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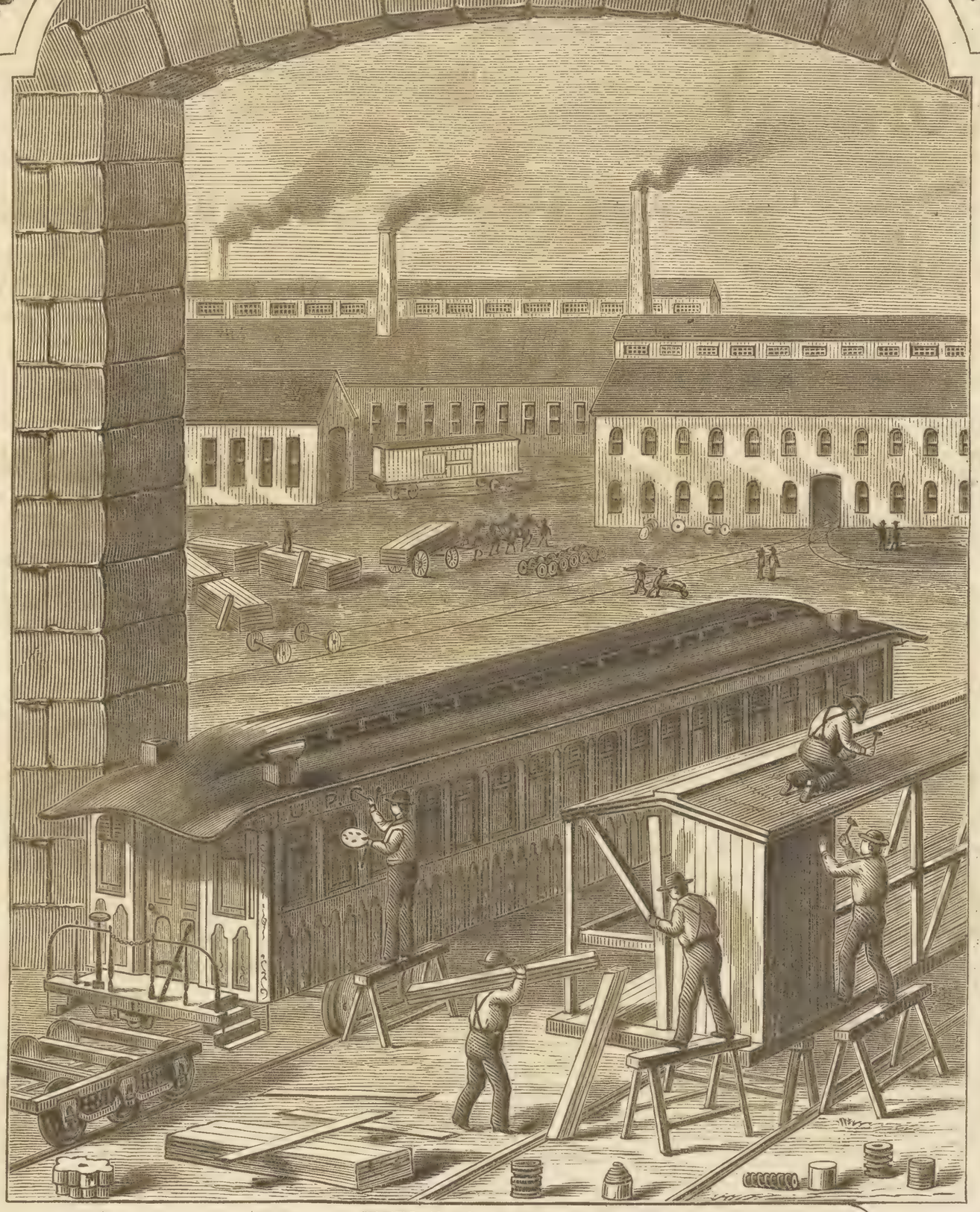
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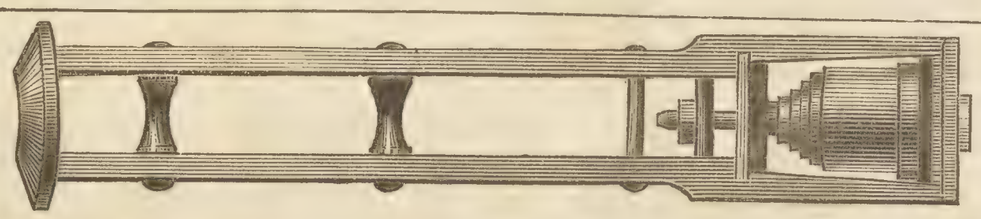
Vol. VI. OCTOBER, 1875. No. 10.



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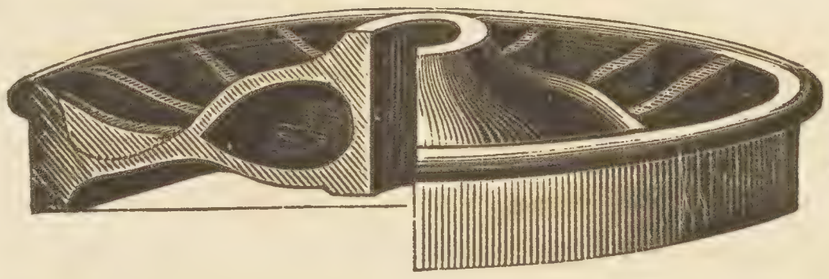
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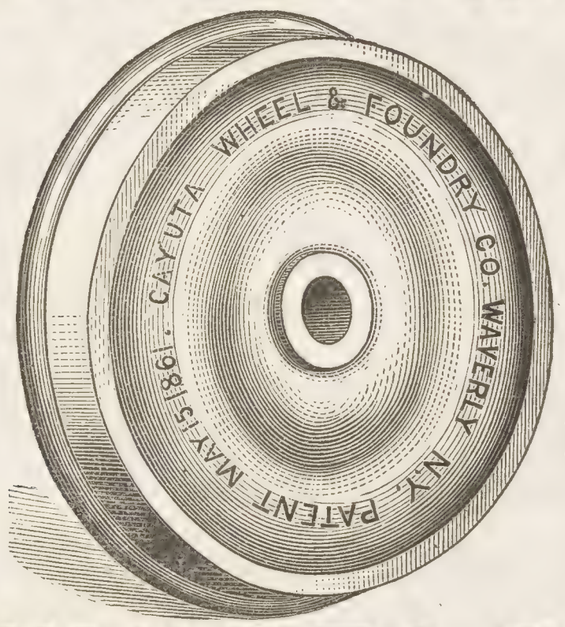
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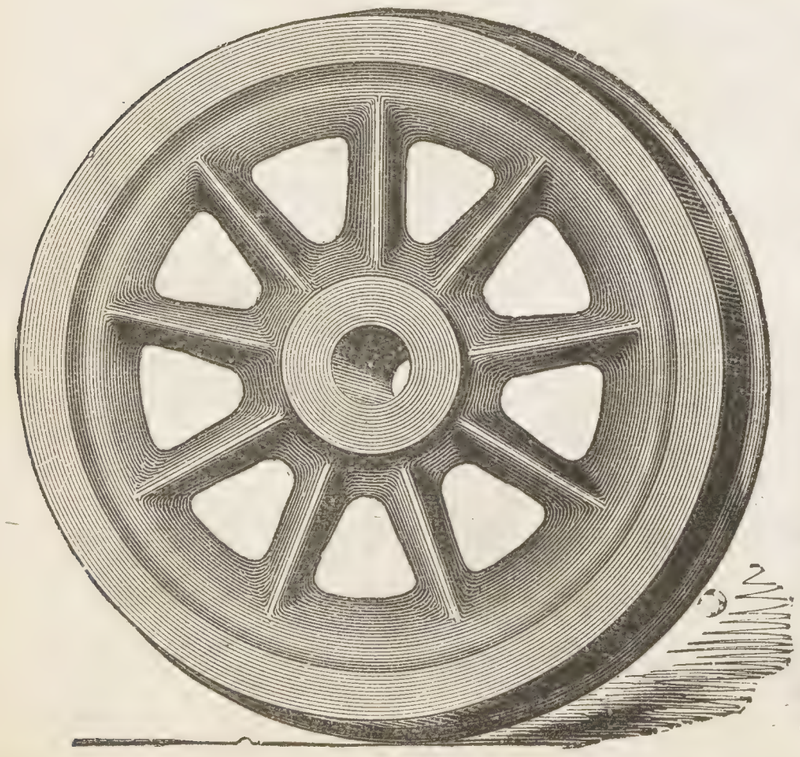
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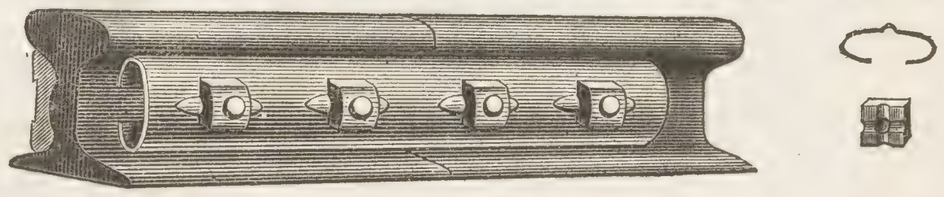
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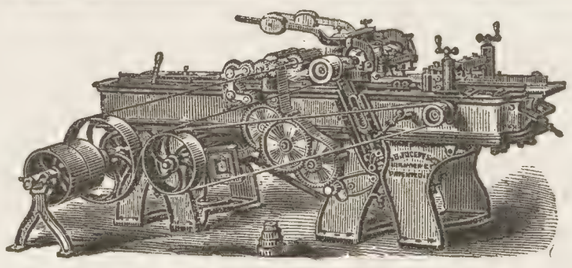
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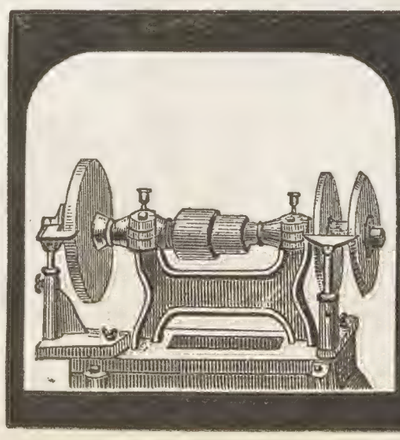
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Hitchcock Car Ventilator.

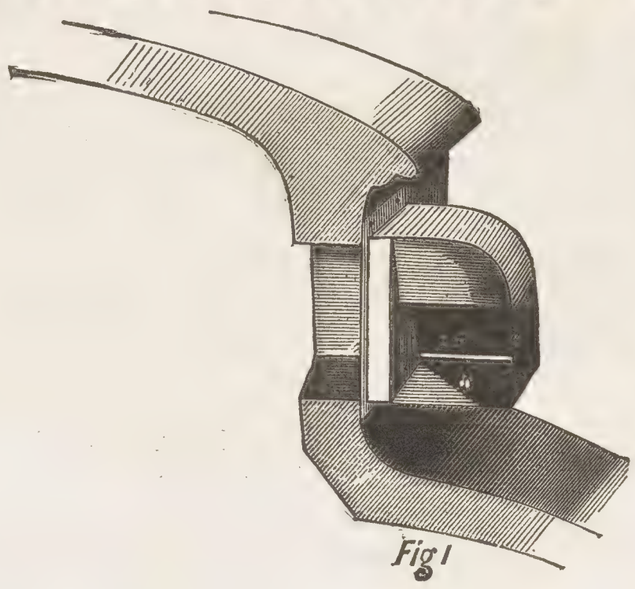
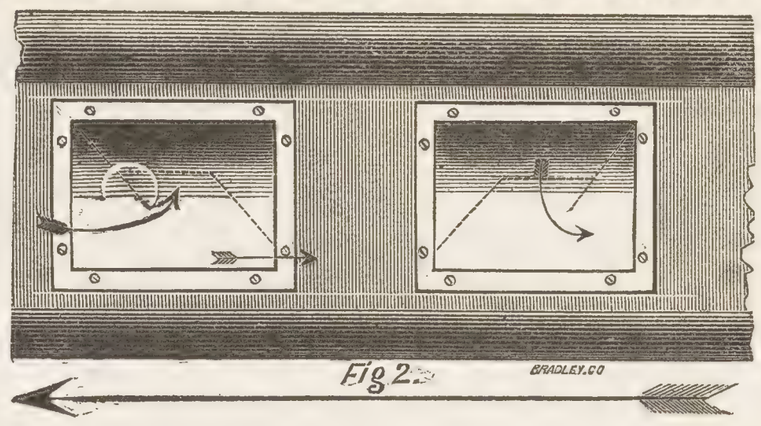


Fig 1



THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place. it is always in readiness, and runs itself independent of all employees.

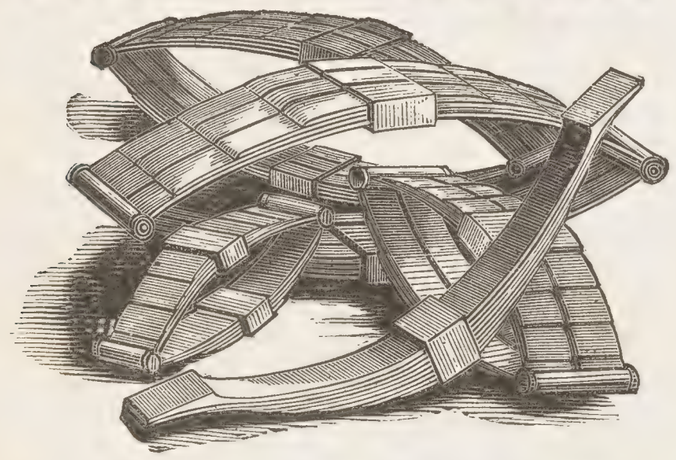
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ROBERT HITCHCOCK, Inventor.

HALF AND FULL CAST-STEEL

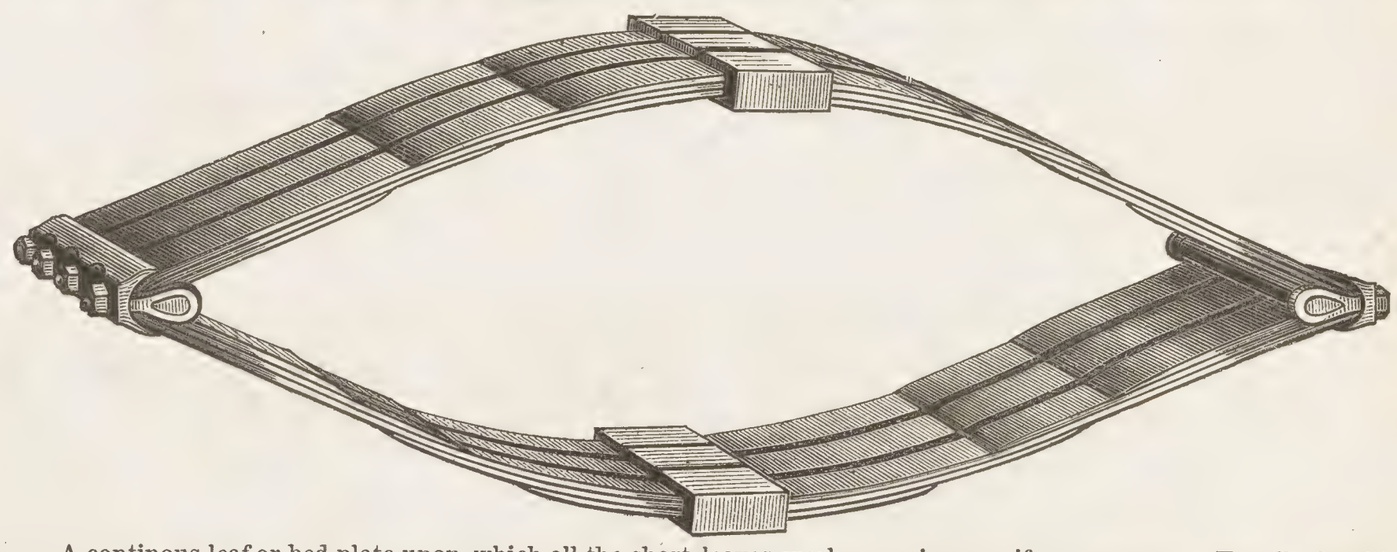
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A continous leaf or bed-plate upon which all the short leaves work, securing a uniform pressure. Equally durable with ordinary elliptics, and saves thirty per cent of dead weight. In successful operation on a number of roads. Made of best cast steel. CHEAPER, LIGHTER, MORE ELASTIC.

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[Working Capacity, 1000 Men.]



Manufacturers of Sleeping, Saloon, Drawing-Room, Passenger, and Freight Cars of Every Gauge.

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Steel Wire Broom and Brush Works,

MANUFACTURERS OF

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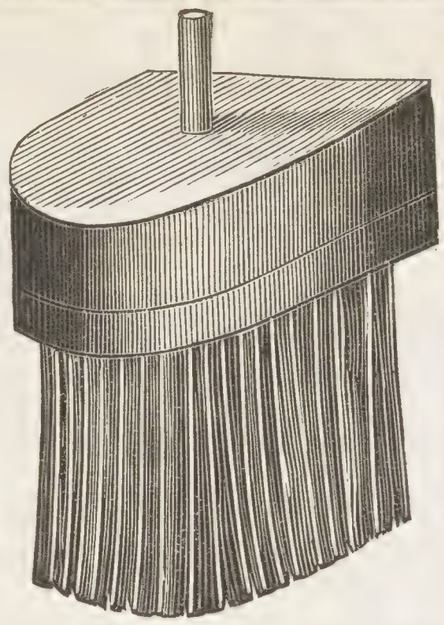
THESE BROOMS ARE USED UPON ALL THE PRINCIPAL RAILROADS THROUGHOUT THE UNITED STATES AND CANADA, AND ARE WARRANTED TO GIVE SATISFACTION.

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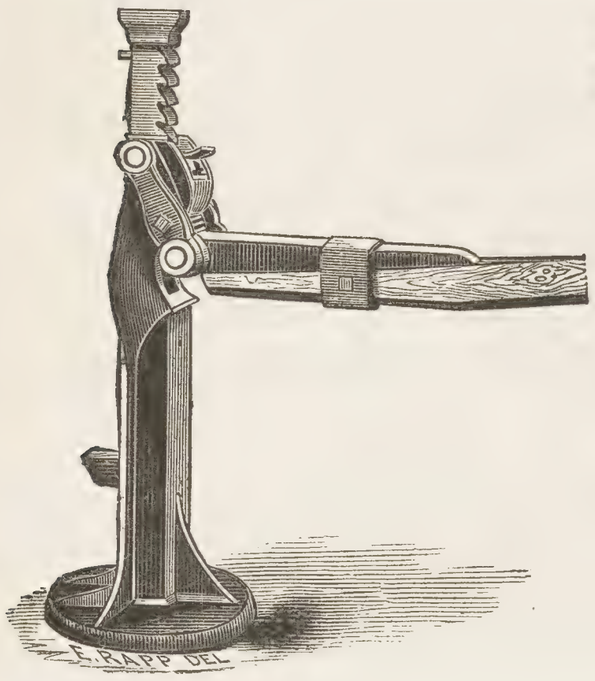
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ADAPTED TO ALL KINDS OF LIFTING,

BUT ESPECIALLY TO

BRIDGE AND RAILROAD WORK.

Nearly all the Railroads in the United States have these Jacks in use, and the testimony in every instance shows a very great economy in

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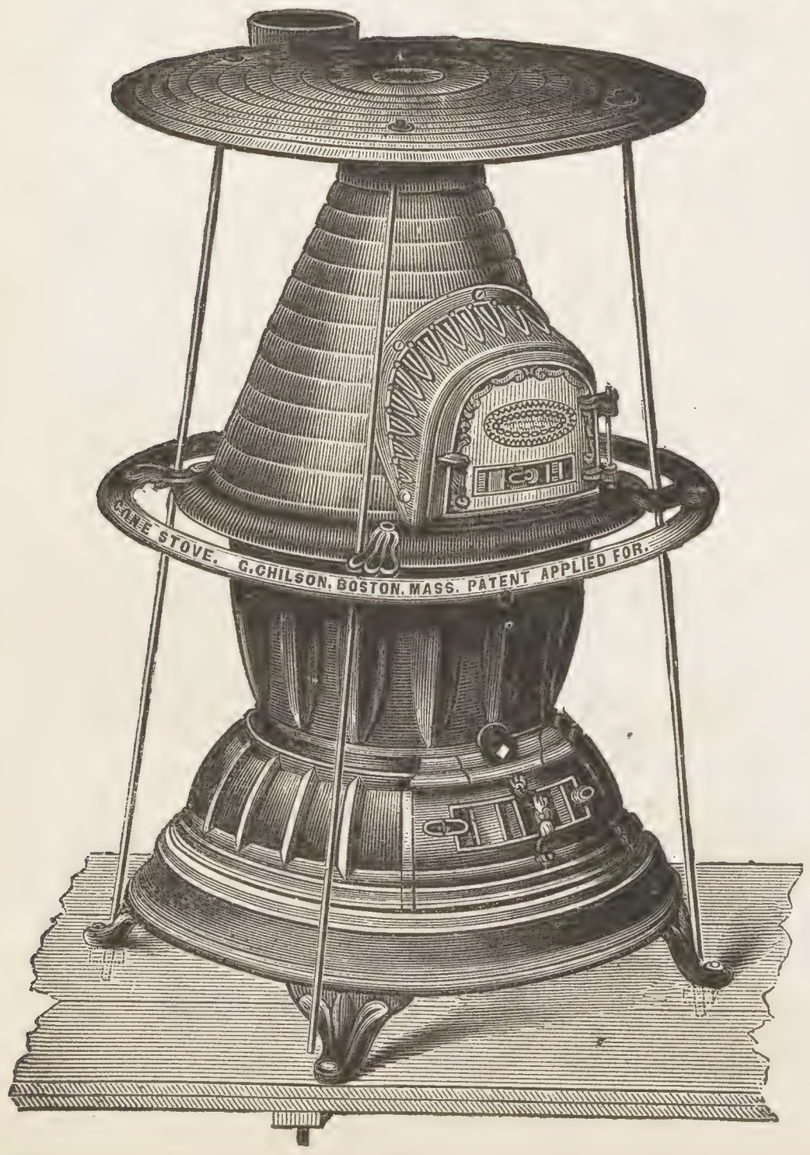
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A NEW RAILWAY CAR STOVE.

Chilson's Patent Cone Disk Stove

ON A NEW AND MODEL PLAN.



I WOULD respectfully call the attention of Railway Managers and others interested in warming Railway Cars, Station Houses, etc., to this Stove, which has been thoroughly tested on several of our railways for a few years past, and has proved in every instance the most successful plan yet devised for thoroughly warming Railway Cars. This Stove is on a new and model plan, differing in principle and operation from all others in the United States. I claim for it *Safety, Economy, Durability, Simplicity, Cleanliness, and Beauty of Design.* Its peculiar merits may be stated as follows:

1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.

2. The broad radiating disk prevents the heat from ascending to the upper part of the car or room, but distributes and throws it down to the floor, thoroughly warming the lower currents of cold air in the car or room for a great distance around the Stove, thus securing the long desired object of making the *lower part of the car and floor comfortably warm, especially for the feet.*

3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stoves.

4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.

5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*

6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories, Stores, Offices,* RAILROAD CARS, and STATION HOUSES, *School Rooms, Workshops, etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

The BOSTON AND PROVIDENCE RAILROAD COMPANY have over two hundred of these Stoves in use, and the BOSTON AND ALBANY and several other Roads are adopting them, with the most perfect success.

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Superintendent's Office, Boston, April, 1873.

GARDNER CHILSON, Esq.: *Dear Sir:* We have about two hundred of your new "Cone" Disk Stoves in use, (a part of them for nearly five years,) for warming Passenger Cars and Stations. I can truly say that they have given entire satisfaction. These Stoves possess many important advantages over any other we have ever used, viz.: for warming the floor and displacing the cold air in the lower part of the car, whereby they are rendered much more comfortable, especially for the feet, than by any other plan known to us. The Stove is more economical in the consumption of fuel, more substantial in construction, and consequently requiring less repairs than any other in use, and so securely constructed as to prevent fire from getting out of the stove even should the car be *overturned.* I cheerfully give my testimony in favor of this Stove, and commend it to all Railroad Managers.

Yours, etc., A. A. FOLSOM, *Superintendent.*

Numerous other testimonials received from Railroads and other persons having these Stoves in use in Halls, Stores, etc., may be seen at office. Bolts are not required except for Cars and Steamboats.

Chilson's Improved Celebrated Cone Furnaces, for setting in Brickwork or in Portable Casings, Chilson's Unrivaled Double-Oven Brick Cooking-Range; Chilson's New and Splendid Arlington Portable Range; Chilson's very Superior Arlington Cooking Stove; Parlor, Office, and Store Stoves, Parlor Grates, Registers, Ventilators, etc.

Special attention given to putting up Furnaces and Ranges, and the ventilation of buildings in any part of the country.

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Warranted Fire, Water, and Weather Proof.

Will cover more surface and outwear any paint manufactured.

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MASTER PAINTER'S OFFICE,
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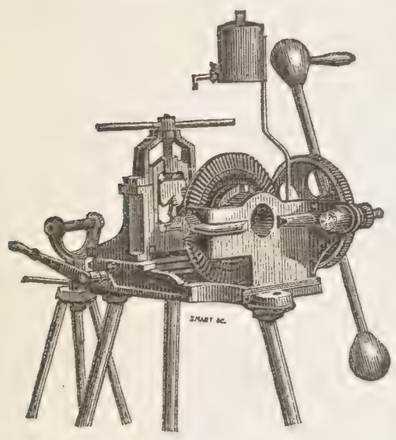
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Pipe-Cutting and Threading Machine.



This important tool is designed to fill a want long felt by STEAM AND GAS FITTERS AND MACHINISTS for cutting and threading pipes rapidly and cheaply. An Apprentice Boy, with one of these, can do more work than Two Men with old appliances under our old system. No PIPE SPLITTING! No BEVEL INSIDE OR OUT! It cuts threads and makes nipples for all sizes of pipes, from ½ to 2 inches. Stronger than any machine made. A full set of collars for making nipples goes with the machine.

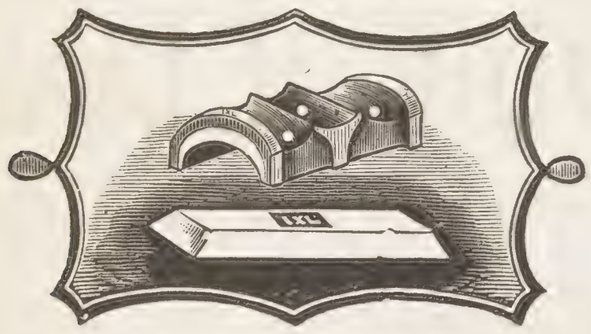
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The Chase Manufacturing Co.,
120 Front St., New-York.

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For sale by MORRIS, TASKER & CO., Philadelphia, New-York, and Boston; and W. H. BANKS & CO., 34 and 36 South Canal Street, Chicago.

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NO BELTS, BELLOWS OR CRANKS;
THE BEST MADE.
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IMPROVED ADJUSTABLE CRANK PIN.
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Used by L. S. & M. S. RY. I. & ST. L. R. R.
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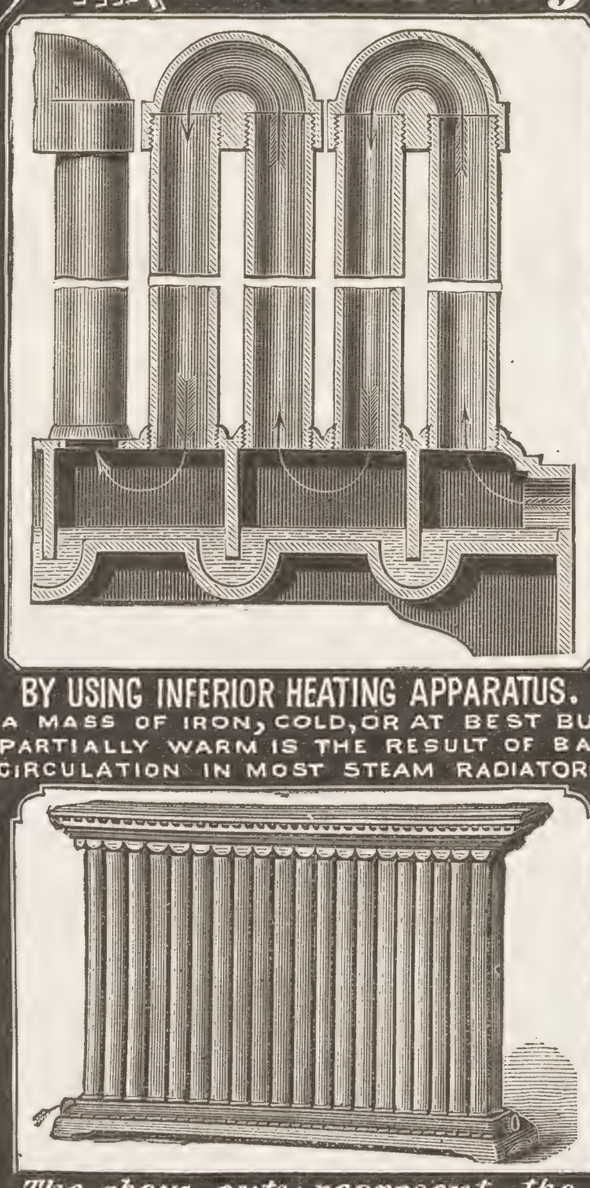
OFFICE OF PURCHASING AGENT
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Very respectfully yours,
A. C. ARMSTRONG.
Gen'l Purchasing Agent L. S. & M. S. R. R.

Don't THROW AWAY YOUR Money

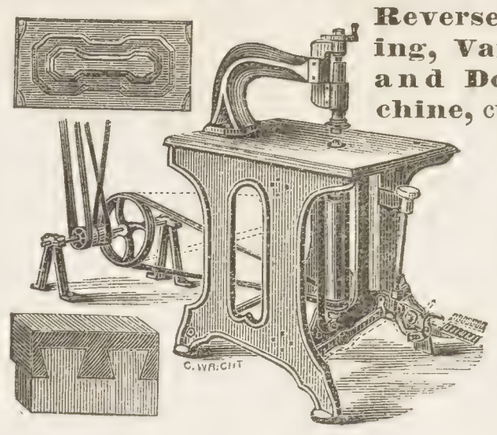


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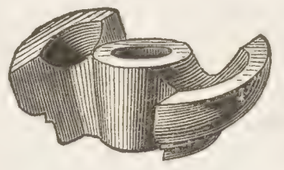
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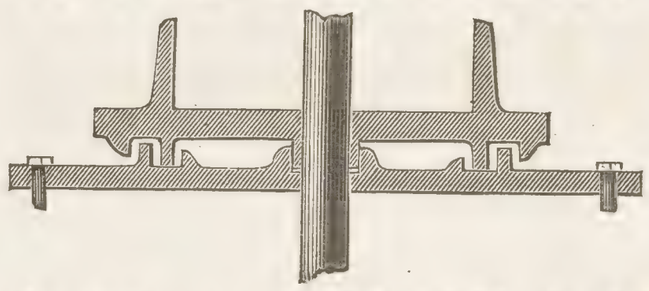
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FOR RAILWAY CARS,

With Oil Receptacle for Bearing-Ring to work in. They are acknowledged to be the best in use. See description and drawings in CAR-BUILDER for January, 1874.

Address, AMBROSE WARD,
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MANUFACTURERS OF

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TIRE AND TOOL

CAST-STEEL,

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WALL'S MAGIC RENOVATOR.

For Cleaning and Polishing Gold, Silver, Nickel, Brass, Copper, and Lacquer Gilt on Metals. A chemical liquid free from acids, which will remove all tarnish, dirt, and grease, from whatever cause, almost instantaneously, and without injury to the metal.

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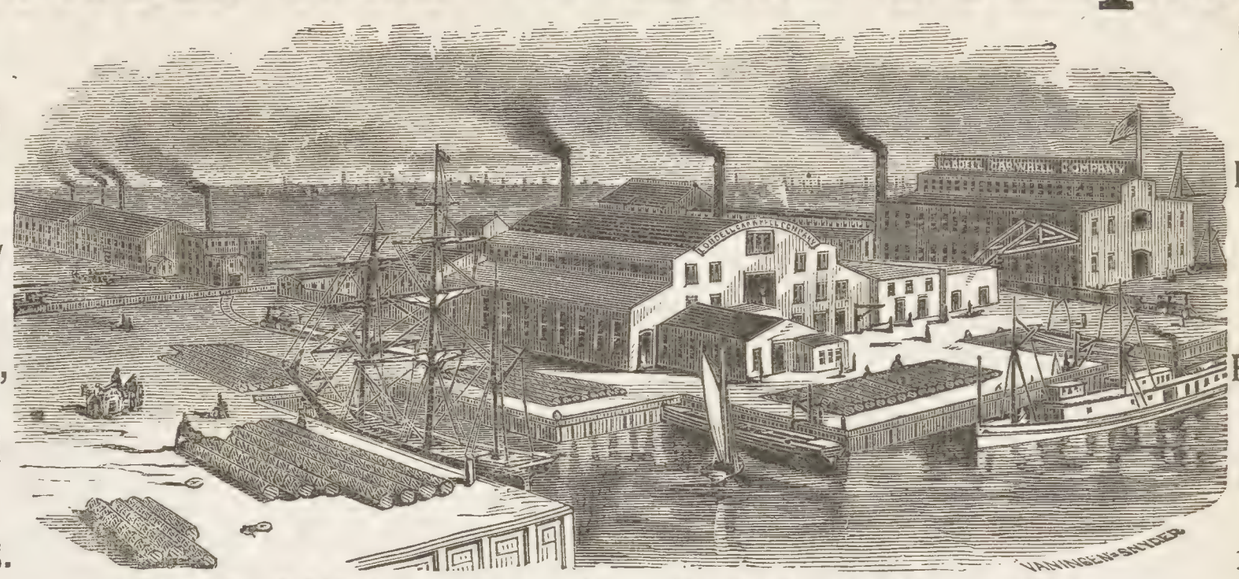
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RAILWAY CAR VARNISH.
Elastic, pale, and extremely durable, possessing great brilliancy of lustre, and producing a hard, fine **finish,** resisting in the highest degree effects of time and exposure. Should be used over our Rubbing.

RAILWAY RUBBING VARNISH.
Hard-drying, works freely on large panels, will not sweat out, and is very desirable where a fine and durable surface is requisite on which to finish.

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Dries readily, with brilliant lustre; durable under severest exposure in any climate.

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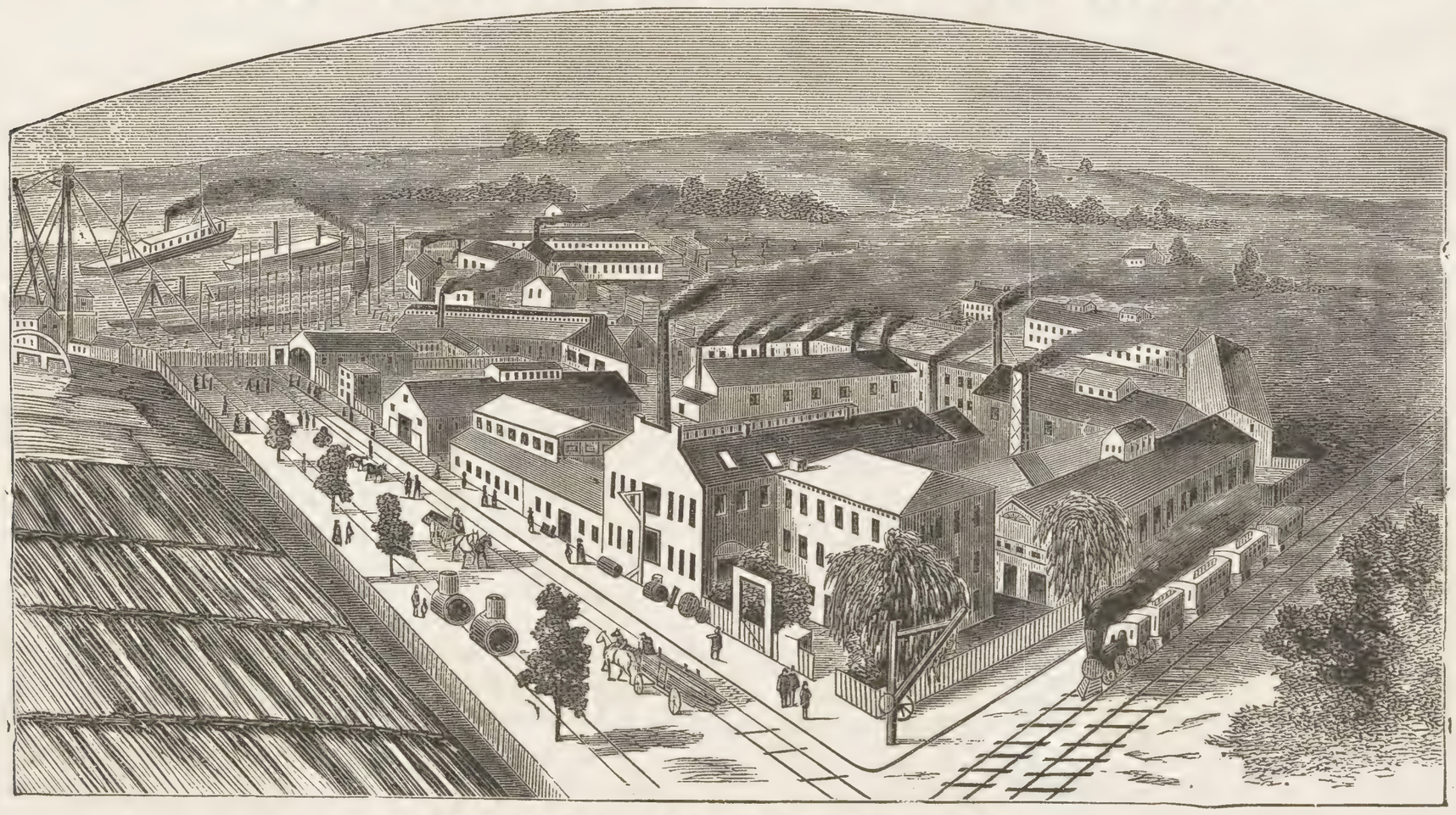
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They dry hard, and resist effectually the severest exposure to action of **Cinders, Smoke, or Climate,** having been tested for many years by the leading Railroads of this Country and have proved, for **brilliancy** and **durability,** fully equal to any of either Home or Foreign Manufacture.

THE HARLAN & HOLLINGSWORTH CO.,

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BUILD ALL KINDS OF

RAILROAD CARS:

FIRST and SECOND-CLASS DRAWING-ROOM, SLEEPING, BAGGAGE, MAIL, and EXPRESS, BOX, and FLAT.

MURPHY & CO., NEWARK, N. J.,

MURPHY, SHERWIN & CO. CLEVELAND,

Varnish Makers.

We call attention to the following prices of our Varnishes especially adapted to Railway Uses, and submit that they combine more prominently than any others, the INDISPENSABLE REQUISITES for Railway Consumption. They are of heavy body, light color, quick drying, and are guaranteed to give a maximum of durability.

Wearing Body, (For Outside Finishing.)	**$5 50**
Hard-Drying Body, (For Under Coats on Cars.)	**5 00**
Rubbing Body, (For Under Coats on Cars.)	**4 50**
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Engine Finishing, (For Last Coats.)	**5 00**
Engine Rubbing, (For Under Coats.)	**4 50**
Japan Gold Size, (For Binding and Hardening Colors.)	**3 50**
C. M. Japan, (For Drying and Binding Paints.)	**2 00**
Black Enamel, (For Smoke Stacks of Engines.)	**3 00**
No. 1 Black, (For Iron-Work.)	**1 50**

UNIFORM SUPERIORITY IN QUALITY AND FIXED PRICE TO ALL will continue to characterize these goods, and Satisfaction in their use is assured.

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JEWETT & SONS PERFECTLY PURE WHITE LEAD TRADE MARK

JEWETT'S PERFECTLY PURE LINSEED OIL RAW, BOILED & REFINED.

WHITE LEAD AND LINSEED OIL.

JOHN T. LEWIS & BROS. WARRANTED PURE WHITE LEAD. PHILADA.

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Page 1.

THE DISNEY CAR COUPLER,

. Patented June 24th, 1874. Manufactured by

F. E. CANDA & CO.,

CHICAGO, ILL.

Fig. 1.

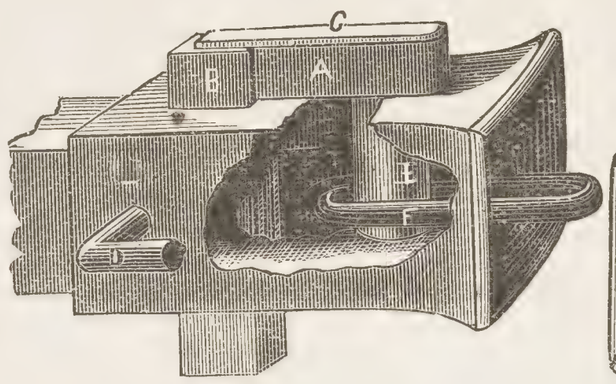


Fig. 2.

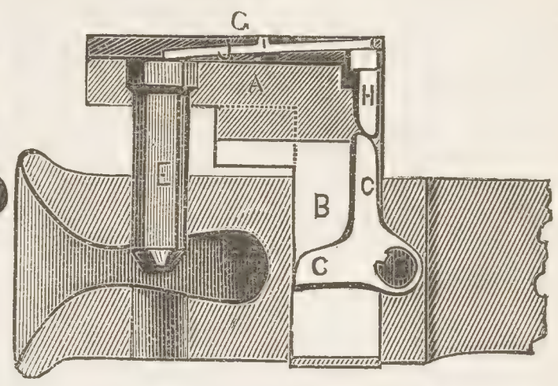


Fig. 1 represents the draw-head with a portion broken away to show the interior.

Fig. 2 represents a vertical, sectional view. *A B* we designate *The Drop*, the upper part *A* serving as the pin-holder. *D* is a lever by which the device is operated, fastened to a shaft passing through the draw-head. *C C* is a forked piece keyed to this shaft. *H* is a small loose pin. *E* is the large pin for securing the link *F*. *J* is a lever resting on the heads of pins *E* and *H*, with its fulcrum on cap-piece *G*. *Then*, when set for coupling or uncoupling, as in Fig. 2, the link *F*, in passing the mouth of the draw-head, raises pin *E*, which by lever *J* forces pin *H* against and displaces the upper arm of *C C*, allowing the *drop* to fall, carrying pin *E* with it.

From the above cuts and description it is apparent that this device combines simplicity in its construction, reliability in its working, and durability in all its parts.

We designate as points of special advantage:

That working from the side of the draw-head, it leaves no opening at the top for dirt, gravel, or accumulations of ice and snow to interfere with the working of the coupler.

That, while the link is always held in a horizontal position for entering, yet it has sufficient vertical movement to accommodate itself to cars of different heights, not exceeding a variation of six inches, without using the crooked link.

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THE NATIONAL CAR BUILDER.

DEVOTED TO THE INTERESTS OF RAILWAY ROLLING STOCK.

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Steel and Iron Car-Axles.

From the Journal of the Franklin Institute.

DURING the session of the American Railway Master Mechanics' Association, in New-York, last May, some experiments were tried to show the comparative strength of cast-steel and wrought-iron car-axles. The experiments appear to have been conducted under the supervision of a committee appointed by the Association, the steel axles having been furnished by the Midvale Steel Works of this city, and the iron axles selected by two members of the Association who desired the test, one lot of iron axles having been forged expressly for the test, at the shops of the gentleman furnishing them, the other lot having been selected by the other gentleman from the axles used successfully on the road under his charge. These experiments consisted in letting fall a drop weight of 1,600 lbs. from heights of 25 and 35 feet upon the bars of iron and steel which rested on rigid supports placed 3 feet apart, the blow being delivered midway between the supports. While some iron axles stood three or broke at the fourth blow, others broke at the second blow, all of 25 feet fall, and the only steel axle that was broken at all had three blows of 25 feet and then eight blows from the height of 35 feet.

It may be well to state that the experiments tried in New-York were merely a repetition or an exposition of the test adopted by railroads using steel rails in determining the fitness of the steel for railroad purposes. On the reasonable assumption that car-axles are submitted to strains requiring stiffness and strength, the test of dropping a weight upon the axle and noting the deflection seems one that would naturally be resorted to. It has, therefore, come to be common practice in ordering steel axles, that for one hundred axles ordered, a certain number agreed upon in addition shall be furnished—that this additional number, selected at random from the pile, shall be subjected to the following test: they are placed one at a time upon rigid supports, 3 feet apart; upon the center of the axle, midway between the supports, a drop weight of 1,500 lbs., raised 25 feet, is allowed to fall that distance. The amount of bending caused by the blow is noted. The axle is turned over and another blow from the same height is given, which straightens the axle more or less; so, turning the axle between each blow, five blows are given. If all the test-axles stand these blows, the whole lot is accepted; if any of them break, they are all rejected. It is usual to continue the test by blows of 1,500 lbs., drop falling 40 feet, until the axles are broken, but all blows after the first five are not considered in the test, so far as the acceptance of the axle is concerned. The trial of the sample axles is supposed to show two things: great strength to resist strains or shocks, and in relation to the amount of bending, the hardness or stiffness of the material. We have seen steel-axles break on the second blow, and we have seen them so tough as to require many 40 feet blows to break them. We can not but think the test the best one possible, under the circumstances.

It has been our intention to comment on these experiments, but we delayed doing so to obtain some definite information from prominent railroads as to the success of the steel axles in actual use. While engaged in this inquiry, we are met by an article in one of our exchanges, a widely circulated paper, devoted to the iron interest. The article is headed "Steel Railway Axles." After commenting on the nature of the test, the writer says: "If tests made by means of weights subjected an axle to strains in any respect similar to those it encountered in actual service, the results might be considered as conclusive; but they do not; consequently they are practically valueless as determining whether steel is, or is not, a better material than iron for this use." Again: "It (steel) has from time to time been tried on railroads, and each time abandoned." Then the writer gives his conceptions of the reasons for this, and further on says: "Steel axles have been placed under cars on several different railroads, by gentlemen with whom we are acquainted, and in each case they were abandoned on account of their liability to heat. We know this as a fact, although we do not know the reason for it." These few sentences suggest a treatment of the subject not originally intended. That steel car-axles should have been tried and then abandoned, is not surprising, as the cost of steel is even now very much greater than the cost of iron. But that their use should have been abandoned on account of steel being more liable to heat, is a matter of great surprise, and worthy of careful consideration. An inquiry of the leading engineers other than railroad engineers, fails to elicit any experience that would seem to confirm this statement. All that we have heard about steel being liable to heat, comes to us in statements somewhat like the article above referred to. That is to say, a mere assertion without any explanations of the conditions under which the trial has been made.

We are told by the writer before alluded to, that a certain size of journal is needed for purposes of lubrication, and that the Master Car-Builders' standard axle has journals $3\frac{3}{4}$ inches diameter, while $3\frac{1}{8}$ inch journals are carrying the load with probably a large margin of strength, but with too little surface for lubrication. Friction being independent of surface within certain limits, the $3\frac{1}{8}$ inch journals in iron, if 5 inches long, may heat; if 6 or 7 inches long, may, with its lateral increase of surface, bear the load with safety from heating, and no more frictional resistance, because the diameter, and consequently the surface velocity, has not been increased. Does it not seem reasonable, that with some stronger and stiffer material than iron, the journal may be made to present to its brass box the amount of surface needed to prevent abrasion in a less diameter and a greater length?

There really seems no reason why the practice of the railroads should differ materially from the practice of the workshop. Car-axles revolve under conditions not much worse than the journals and shafts in any machines, and what applies to one applies as much to the other. Any journal, if submitted to too much pressure, will heat. When it does heat from causes other than want of proper lubrication, it is necessary to diminish the load, to diminish velocity, or to extend the surface under pressure, and in the case of a journal, all other things being equal, this extension can best be made useful by extension in length, not in diameter. In an overhanging journal, as the outside bearing of car-axles, an enlargement of diameter increases velocity of the rubbing surfaces, and so increases the frictional resistance, inasmuch as the same frictional resistance is acting at a greater distance from the center. An increase of length, the diameter remaining the same, will diminish the wear without increasing the frictional resistance, inasmuch as the pressure per square inch of surface will be less. When the limit of extension has been reached in such journals on iron shafts of a given strength, no engineer would hesitate to make them still longer if a stronger and stiffer material can be substituted for the iron.

At the same session of the Master Mechanics' Convention at which the steel axles were tested, the form of iron axle recommended by the Master Car-Builders, with a journal $3\frac{3}{4}$ inches diameter, 7 inches long, was not adopted on account of its being larger and heavier than axles doing good service, and in the minds of some who voted, on account of the probable introduction of *steel* axles of a much smaller size than could with safety be made of iron. While some roads, as we are told, have tried and abandoned steel car-axles, we know that others have used them, and are using them successfully after a continuous experience of many years.

We have made inquiry of one railroad using steel axles extensively, and found that it alone has nearly 26,000 steel axles in use under its passenger and some freight cars.

It may be asked why roads so using them do not take advantage of the extra strength and stiffness, and reduce the size of the axle, to diminish the dead weight, to diminish the cost, and to diminish the frictional resistance?

We hope soon to be able to present to the readers of the *Journal* a statement of the experience of this railroad, now using 26,000 axles, when it will be seen that that road does use as long a journal, and one of smaller size than that recommended by the Master Car-Builders' Association, and use it to advantage, made of steel.

That other railroads using steel axles should not at once avail themselves of this advantage of steel, is clear enough to those familiar with the management of roads. Changes in such matters, as size of axles, involve great changes in many other portions of the cars. Such changes can not be made at once; a wise policy retains existing sizes, but insures security to

passengers by the use of the stronger material in the equipment of passenger cars, and then slowly and surely makes any changes that may seem warranted by experience, not of one year, or two years, but of many years, and as indicated by the clear record of all that experience.

Inasmuch as the steel interests of this country are now so rapidly increasing, we deem an inquiry into its possible displacement of iron in engineering practice of great importance.

We have been informed that steel is entering more and more largely into the construction of locomotives abroad, and if we mistake not, the engines made for a Russian railway last year by the Grant Locomotive Works, of Paterson, N. J., had all parts that could be, made of steel. The rapid advance of the steel manufacture in this country, and the cheapening of the material by improved methods of manufacture, demand a careful consideration of its merits in machine construction.

Steel is now procurable of different qualities, suited to different uses to which it may be applied, and we think the time is near at hand when these qualities will be so well defined as to render their selection by the engineer an easy matter. All the so-called steels, from the finest tool steel down to the qualities which contain so little carbon as to prevent them from showing any hardening properties when heated and cooled suddenly, seem to have physical properties which readily distinguish them from what we know as bar or wrought iron. The process of manufacture of the low grades of steel is so distinct from the mode of making the wrought iron of commerce, that the so-called steel, containing the least possible amount of carbon, differs materially from the so-called wrought iron which has been proved to contain the greatest amount of carbon. This difference is marked in regard to strength and stiffness. Steel of all grades, from the softest up to the hardest, behaves differently in the lathe from wrought iron, presenting a more uniform surface when turned or planed, and seldom showing any sign of seam or fiber, as is evidenced in wrought iron.

This finer surface, the greater strength, the greater stiffness, seem to indicate it as *par excellence* the material for machine construction. On railroads, steel rails are taking the place of iron, steel tires are encircling the driving-wheels, steel sheets form the boilers, and steel connecting-rods of light model are in some cases taking the place of the more cumbersome iron ones; but yet we are told that steel car-axles are more liable to heat than iron ones.

We have heard the same statement made of steel crank-pins; we have, therefore, included them in our inquiries of railroads using them, and we look for the report now being prepared for us with interest. In machine-shop practice, we found examples of steel crank-shafts succeeding where iron shafts failed.

As an illustration of this deplacement of iron by steel, in engineering practice, mention may be made of the experience of a firm in this city. Some small engines were being constructed, intended to be run at high speed, 900 revolutions per minute. They were fitted with wrought-iron crank-shafts, carefully fitted to run in phosphor-bronze bearings. In the first trial of one of these engines, the shaft cut so badly as to stop the engine long before the proper speed had been obtained. The shaft was taken out, smoothed up, and the bearing carefully lapped out, to give more room for oil, and, under an unusual lubrication, it again cut. A case-hardened iron shaft was tried with slightly different results. Steel was then used, and the same size steel shaft ran without cutting, and showed, after long use, no unusual wear. The steel used was that known as machinery steel, and was adopted in place of iron, only on account of its being stiffer. A careful examination of the conditions under which the soft iron and the case-hardened iron gave out, clearly indicated that the shaft bent in the journal under the pressure of the work on the crank.

In machine-shop practice, iron shafts are used on account of their cheapness, wherever practicable; but when it is deemed advisable not to increase the diameter, on account of the velocity, or for other reasons, steel is always resorted to as permitting greater strains, so that in considering the proportions of machines, it is common usage, in case of doubt as to strength of shafts, to substitute steel for iron.

A Model Railroad Report.

THE annual report of the Louisville and Nashville Railroad Company for the year ending June 30, 1874, makes a volume of 223 pages, and is a thorough and comprehensive exhibit and analysis of all the elements of operation and expenditure existing on such road. A large portion of the volume is occupied with tabular statistics embracing in full detail, under forty-five heads, every item of construction, equipment, expenditure, and operating economy of the main line and the several branches. These admirably-arranged statistics are worthy of the careful attention of all railroad men; but more especially should they be studied by the advocates of legislative interference with railway operation in the matter of rates and charges.

The Vice-President and Superintendent, Mr. Albert Fink, in his report to the President of the road, gives his views upon many intricate problems of railway economy and operation, in a way that is calculated to correct the erroneous impressions which so extensively prevail, not only with the general public, but among stockholders and directors of railways. After showing that the percentage of net to gross earnings is no criterion of the economy of operation, he also points out the fallacy of any just comparison between the operations of two different years, without considering the amount and character of the business, whether through or local, the cost of labor and material, and a proper discrimination in the expenditures belonging to each year. The only way to ascertain whether a road is operated economically, is to examine each item of expenditure and see whether it has been reduced to a minimum, and the service rendered for it to a maximum. For this purpose, the operations of each piece of road, as regards expenses and revenue, are tabulated under 102 heads, and the statements of operating expenses under 77 sub-accounts. The results show the great importance of discriminating between those expenditures which vary with the work performed and those which are independent of such work. These latter have to be separately ascertained in each case; they are of the nature of a tax upon the business: the smaller the business, the greater the tax. What the tax may or should be per ton or per passenger in any one case can not be predetermined by any general rule or law, but only after the two elements on which it depends—the fixed expenditures and the amount of work really done—are actually known. These elements vary on all roads; it would be a singular accident to find them alike on any two. The disregard of these facts in estimating the cost and the value of railroad transportation with a view of judging of the reasonableness of railroad tariffs, has led to many erroneous conclusions, which appear to be now fixed in the public mind.

Mr. Fink also says, that in order to estimate the cost of transportation under the various conditions that occur, it is necessary to classify the expenditures, and to separate those that increase with the amount of work done from those that are fixed and independent of it; and to ascertain the ratio of increase of cost with the increase of work. Without such an analysis of the cost, it is impossible to solve the question of cost of transportation that arises in the daily practice of railroad operation. A mere knowledge of the average cost per ton-mile of all the expenditures during a whole year's operation, is of no value whatever in determining the cost of transporting any particular class of freight, as no freight is ever transported under the average condition under which the whole year's business is transacted. We can not, therefore, make the average cost per ton-mile the basis for a tariff, if it is to be based upon cost; but we must classify the freight according to the conditions affecting cost of transportation, and ascertain the cost of each class separately.

The problem of ascertaining the cost of railroad transportation is not quite so simple as it may at first sight appear. It is much easier to determine the cost of wagon, canal, or steamboat transportation. The common carrier by wagon or canal knows the exact amount of toll he has to pay, and assumes no risk of an investment in an expensive roadway. Nature furnishes a roadway to the carrier by steamboat, and keeps it in repair free of charge. Hence in estimating the cost of transportation by wagon, canal, or steamboat, two of the most uncertain and changeable elements, and at the same time the costliest, of railroad transportation, are eliminated from the calculation.

Railway companies are not only common carriers; they are also proprietors of a roadway. Their tariff charges are not only for transportation service proper, for the service rendered as common carriers, but also for the use of the roadway, for its maintenance, and for the risk assumed in the investment.

With what reason, then, can the State regulate railway tariffs by the same rule as that for service of common carriers simply—namely, the measure of the weight of freight and distance carried, using the ton-mile as a measure of cost incurred by the companies as proprietors of a roadway? This service must be measured by different rates; the cost of roadway, the rate of interest and discount, the cost of maintenance, and the actual use made of the roadway, alone form the proper data for calculation. And this varies greatly with different roads. On the seven roads operated by this company, for instance, the cost to the company varied from 0.7 cents to 12.6 cents per ton-mile, though the service rendered was exactly the same—the use of the roadway for one mile for the purpose of moving over it one ton of freight.

Mr. Fink shows the great variation in the cost of railway transportation on different roads, and the causes which produce it, and from this argues the impossibility of enacting general laws establishing tariffs applicable to more than one road. What is reasonable compensation for railway transportation service, or what constitutes just or unjust discrimination in railway charges, is not a question that can be decided *à priori*, or that can be formulated into a general law. It can only be decided in each individual case when all the conditions under which the service is performed and the elements controlling its cost are known; in most cases it can only be decided correctly after the service has been performed.

It would be just as sensible to predetermine by legislation what shall be the cost of raising a bushel of corn as to predetermine the cost of carrying a ton of freight. The action of the sun and rain upon the growth of the corn and the quantity of the yield are no less uncertain elements than some of the elements which enter into the cost of transportation service.

Mr. Fink devotes several pages to the questions of governmental regulation of railway tariffs (considering its abstract right and its practicability), and just and unjust discrimination; contending that governmental tariffs are a failure: first, because such control can not be exercised by general laws establishing fixed tariffs without a violation of the rights of the parties owning the property; secondly, because it is impossible under such fixed tariffs to fully develop the usefulness of the railways to their owners or the people.

THE Ohio Falls Car Company recently performed quite a feat in the way of changing the gauge of trucks of 42 cars belonging to Howe's London Circus, the change being from 4.8½ to 5 feet, involving the taking of the trucks to pieces, putting them together again, changing the brakes, pressing off 336 wheels and refitting 168 axles. The job was completed in 40 working hours. The cars consisted of sleeping, passenger, baggage, stock, express and freight.

The Master Car-Painters' Association.

THE sixth annual convention of this Association was held at the Grand Central Hotel in this city, on the 8th and 9th of September. The proceedings were opened by the reading of the reports of the Secretary and Treasurer and of the various committees. The officers of last year were then re-elected, namely; President, M. W. Stines, of the Boston and Albany R.R., Springfield, Mass.; Vice-President, R. G. Beasley, Maine Central R.R., Waterville, Me.; Secretary and Treasurer, R. McKeon, Atlantic and Great Western R.R., Kent, Ohio.

The President then made an able and interesting address, reviewing the progress of the Association and referring to its agency in promoting a better style of car ornamentation, the use of better materials, and greater care and economy in their application. We shall hereafter publish the address in full.

Mr. R. McKeon, the Secretary and Treasurer, delivered the following address on the "Process of Car-Painting," which will be found exceedingly interesting and instructive, not only to members of the craft, but to car-builders and railroad men generally. We give it in full.

MR. McKEON'S ADDRESS.

Gentlemen of the Convention:

In presenting my views on the subject of car-painting, I shall aim to present to you a clear and comprehensive idea of the principal operations connected therewith. I make no great profession of my ability, but I certainly should have acquired some knowledge, and that of a practical nature, some twenty-five years having been devoted exclusively to the business. My long experience and constant practice, bringing me in contact with others of the profession, have given me that knowledge of the art which can only be secured by close attention and some study.

I shall, in my remarks, aim to embody in as little compass and in as plain statements as possible the knowledge I have secured by personal observation, dealing directly with the subject, and hoping that whatever ideas I advance may be of interest to the craft generally, and aid to draw out the views of other members of this association, who are better posted and more able to handle this subject than I am.

I do not claim that I have arrived at perfection in car-painting, nor do I wish to be understood as professing to give instruction to the experienced workman, or to lay down any new plans, or introduce new ideas for their guidance; but we all know that much may be learned and valuable information secured by contrasting the different modes of painting; and all practical car-painters will readily admit that capital ideas have often been advanced by those who have had but a brief experience in the business, compared with others. We can all recall to mind something gained in this way. Some, perhaps, will not admit that the workmen employed under their supervision know any more than they do themselves, and this is equally as true of other trades as of painters, for I have seen work spoiled, simply by the foreman in charge adhering to his own plan, rather than take a suggestion from the workman employed under him. Such pride is not excusable. Some are always stubborn to admit facts, instead of being ready to examine into them; but it is always a wise plan to admit and investigate the theories of others. Do not set yourself forward as perfect in your calling, and you will in the long run acquire greater credit from your employers. We know that by pursuing a work an any subject, we are enabled to combine the experience and observations of others with our own, and the searcher after information will profit accordingly.

A first-class day railway-coach, on any of our main roads, costs, when complete, about $6000. To protect this work, the painter expends from $300 to $600. The latter figure will make a first-class job. The car has been completed in the wood shop, and is turned over to the painter, who is responsible for the finish. He is expected to smooth over all rough places or defects in the wood, which requires both patience and skill to make the work look well. Twelve weeks should be the time allowed to paint a car, and it can not be done in any less time, to make a good job, that will be a credit to the painter and all other parties interested in the construction and finish of the car. Too much painting is done in a hurry; proper time is not given the work to dry or become thoroughly hardened before it is run out of the shop, and consequently it does not always give the satisfaction it should; nor can it be expected that hurried work will be so lasting or durable as that which has the necessary time given to finish it.

The priming coat of paint on a car is of as much importance as any succeeding one, and perhaps *more*. I have seen good work ruined in the priming by little or no attention being given by the painter to the mixing and applying of the first coat. The foundation is the support, and on that rests your success or failure. The priming should be made of the proper material, mixed with care from good lead and good oil, and not picked up from old paints which have been standing mixed, and must necessarily be fat and gummy, for such are unfit for use on a good job, and will have a decided tendency to spoil the whole work. Special care should be exercised, both in mixing and applying the priming, and it should be put on very light, so that it may penetrate well into the wood. Too much oil is worse than not enough. Good ground lead is by far the best material for the under coats on a car, and although I have tried other materials for priming, yet I have failed to find any thing equal to the lead. Two coats should be given to the car before it is puttied, as it is best to fill well with paint the nail-holes and plugs, as well as defects in the wood, so that moisture may not secure a lodgment, which otherwise will cause putty to swell, although sometimes unseasoned lumber will swell the putty, and as it shrinks, the nail remains stationary, and of course the putty must give way.

In mixing putty, which may be a small matter with some, take care to so prepare it that it will dry perfectly hard in eighteen hours. Use ground lead and japan, stiffening up with dry lead, and whatever coloring you may require in it to match your priming coats. The next coats, after the work is well puttied, should be made to dry flat and hard. Two coats should be applied, and for all ordinary jobs or cheap work, sandpapering is all that is necessary for each coat; but when a good surface is required, I would recommend one coat to be put on heavy enough to fill the grain, and before being set, scrape with a steel scraper. The plain surface is all that requires coating and scraping with the heavy mixture; for this coat, which we call "filling," I use one half ground lead and any good mineral which experience has shown can be relied on. This scraping of the panel-work will fill the wood equal to two coats of roughstuff, and saves a great amount of labor over the old process, when so much rubbing with lump pumice-stone was done. Sandpaper when the filling is thoroughly hard, and apply another coat of paint of ordinary thickness when, after another light sandpapering, you have a good surface for your color.

Rough coating on cars has gone almost out of use, and I believe that but few shops are now using it to any extent. My experience is that paint has less tendency to crack where roughstuff is left off. I do not claim that the "filling" was the principal cause of the cracking, if it was properly mixed, but I believe the water used in rubbing down a car with the lump pumice-stone injures the paint, as it will penetrate in some places, more particularly around the mouldings and plugs.

The car being ready for the finishing color, this should be mixed with the same proportions of drier as the previous coat, or just sufficient to have it dry in about the same time. A very great error with many car-painters is using a large portion of oil in the under coats, and then but little, if any, in the finishing coats; this has a decided tendency to crack, the under coats being more elastic. I always aim to have color dry in about the same time, after I have done my priming; by this plan, I secure what all painters should labor to accomplish—namely, little liability to crack. Work will of course crack sometimes, after being out a few months, or when it has repeated coatings of varnish; and using a quick rubbing varnish on work will cause it to give way in fine checks quicker than any thing else. Many of the varnishes we use are the cause of the paint cracking, and no painter has been wholly exempt from this trouble.

The most common cause of cracking is poor japan, which is the worst enemy that the car-painter has to contend with; the greater part of the japan that we get is too elastic, and will dry with a tack, and the "japan gold-size" we have has generally the same fault, although the English "gold-size" is generally of good quality, but its high price is an objection to its use. A little more care in the manufacture of japans would give us a better drier, and few would object to the additional cost. Japan that I have frequently had I found to curdle in the paint; it would not mix with it, but would gather in small gummy particles on the top. Work painted with such material can not do otherwise than crack and scale, and the remedy lies only in getting a good pure article of turpentine japan.

In regard to using ground lead, car-painters differ, as some prefer to grind their own in the shop. I use the manufactured lead, and my reasons for doing so are that it is generally finer than any shop can grind it with present facilities, and it has age after grinding, which improves its quality. You can also get a purer lead and with more body than you can by grinding in the shop, which is a fact that I think most painters must admit; I have tested it very fully, and am convinced on this point.

Permit me to make a few suggestions here in regard to the mixing of paint, which may not fully agree with others' views. There is just as much paint that cracks by putting it on too flat as by using too much oil. I have seen some painters mix their finishing color so that it was impossible to get over a panel of ordinary size before it was set under the brush, and consequently the color would rough up. Color should be mixed so that it will not flat down for some time after leaving it, and then you have got some substance that will not absorb the varnish as fast as it is applied to the surface. This quick drying of color is not always caused by want of oil in it, but because there is too much japan, and a less quantity of the latter will do better work, and make a smoother finish. Give your color forty-eight hours to dry between coats; I always give that time, unless it is a hurried job, and we have very few such jobs in our shop, as experience has fully demonstrated that it is poor economy to hurry work out of the shop before it is properly finished.

In car-painting, both raw and boiled oils are used, and good work may be done with either, but I would recommend oil that is but slightly boiled in preference to either the raw or the boiled. After it is boiled, if it is done in the shop, let it stand twenty-four hours to settle, then strain off carefully; this takes out all the impurities and fatty matter from the oil, and it will dry much better, nor will it have that tack after drying that you find with common boiled oil. Use the proper quantity of drier in mixing your paint, and a good, reliable job will be the result. In car-painting, I would never recommend the use of prepared colors which are ground in oil, as nine tenths of such colors are ground in a very inferior oil, and they may have been put up for a great length of time, in which case they become fatty, and will invariably crack. These canned colors do not improve with age, as lead and varnish do. Finishing colors should all be ground in the shop, unless special arrangements can be made with manufacturers to prepare them, and the color should be fresh, not over six or eight days old after being mixed and open to the air. Enough may be

prepared at a time to complete the coating on a job, but when color stands over a week, it is not fit to use on first-class work, as it becomes lifeless, and has lost that free working which we find in fresh mixed colors; such color may, however, be used upon a cheap class of work, or on trucks, steps, etc., so that nothing need be wasted in the shop.

Three coats of varnish over the color are necessary on a first-class coach. The first coat should be a hard drying varnish put on the flat color; the quick rubbing that some use I would not recommend, but one that will dry in five days (in good drying weather) sufficiently hard to rub, is the best for durability. After striping and ornamenting the car, and when thoroughly washed, give a coat of medium drying varnish; let this stand eight days; then rub lightly with curled hair or fine pumice-stone, and apply the finishing coat, which is "wearing body;" this will dry hard in about ten days, after which the car may be run out of the shop. It should then be washed with cold water and a soft brush, and it is then ready for the road. In varnishing, many will apply the varnish as heavy as they can possibly make it lie, when, as a consequence, it flows over and runs or sags down in ridges, and of course does not harden properly; this also leaves a substance for the weather to act on. It is better to get just enough on at a coat to make a good even coating which will flow out smooth, and this will dry hard, and will certainly wear better than the coat that is piled on heavy.

Varnishing, we claim, can be overdone, some painters' opinions to the contrary. We have heard of those who put two and a half gallons on the body of a fifty-foot car at one application, and we have also listened to the declaration made by a member of the craft, that he put two gallons on the body of a locomotive-tank. Such things are perhaps possible, and may have been done, but if so, we know that the work never stood as well as it would if done with one half the quantity to a coat. In varnishing a car, care should be taken to have the surface clean; water never injures paint where it is used for washing, and a proper attention to cleanliness in this respect, and in the care of brushes used for varnishing, will insure you a good-looking job.

Perhaps your shop facilities for doing work are none of the best, but do the best you can with what you have; select, if possible, a still, dry day for varnishing, especially for the finishing coat. Keep your shop at an even temperature; avoid cold draughts on the car from doors and windows; wet the floor only just sufficient to lay the dust, for if too wet the dampness arising will have a tendency to destroy the lustre of your varnish. Of course, we can not always do varnishing to our perfect satisfaction, especially where there are twenty-five or thirty men at work in an open shop, and six or eight cars are being painted, when more or less dirt and dust are sure to get on the work.

A suggestion might here be made to railroad managers, which is, that no paint-shop is complete where the entire process of painting and finishing a car has to be done in one open shop. A paint-shop should be made to shut off in sections by sliding-doors, one part of the shop being used exclusively for striping and varnishing. I know from experience that nine tenths of the railroad paint-shops are deficient in this particular, and still we are expected to turn out a clean job, no matter what difficulties we are compelled to labor under. Many further hints might be given in regard to this matter of shop facilities and conveniences, but as it is not here my object to argue the point, I leave it with this brief mention.

In regard to the care of a car after it has left the shop, I think more attention should be given to this than is done on many roads. The car should not be allowed to run until it is past remedy, and the dirt and smoke become imbedded in the varnish, actually forming a part of the coating, so that when you undertake to clean the car you must use soda or soap strong enough to cut the varnish before you succeed in removing the dirt. Cars should be washed well with a brush and water at the end of every trip; this only will obviate the difficulty, aud these repeated washings will harden the varnish as well as increase its lustre. We know that in washing a car, where soap is required to remove the dirt and smoke, it is almost impossible to get the soap washed off clean, and if it is not quite impossible, the hot sun and rain will act on the varnish and very soon destroy it. Cars should be taken in and revarnished at least once in twelve months; and if done once in *eight* months, this is better for them, and they will require only one coat; but where they run a year, they will generally need two coats. Those varnished during the hot months will not stand as well as if done at any other time. Painting done in extreme cold weather, or in a cold shop, is more liable to crack than if done in warm weather.

Paint dried in the shop, where there is a draught of dry air passing through it, will stand better than that dried by artificial heat; and you will find, by giving it your attention, that work which has failed to stand, and that cracked or scaled, was invariably painted in the winter season or in damp, wet weather. I have paid some attention to this matter, and know the result.

In concluding these remarks, let me say to the members here, that more thorough organization is what is needed to secure good results. We must labor for this more earnestly in the future, and strive to enlist the interest and co-operation of those of our craft who may be better qualified than we are to explain their experiences in the matter of car-painting, so that we may return to our shops, after these annual meetings, with a store of knowledge which will be of benefit to each of us, and enable us more fully to surmount the difficulties which the car-painter labors under in finishing a car to his full satisfaction.

At the conclusion of the address, a discussion took place as to how much oil should be used in the finishing color, followed by a debate on the subject of hard-drying varnishes.

The second day of the session was occupied in extended discussions upon a variety of topics connected with the painting of cars; in the course of which many interesting facts were brought out, which we shall refer to more particularly in our next issue.

Committees were appointed to report at the next convention on the following subjects: Paint and Varnish Cracking; Priming and Preparation of a Car Ready to Varnish; Surfacing, and the amount Practicable to put on a Car; Colors, their Manufacture, Adulteration and Causes of Fading; Ornamentation, including the most adaptable styles for Car Work, also Best Gold Sizings and Colors.

After a vote of thanks to Mr. C. A. Smith, Secretary of the Master Car-Builders' Association, for tendering the rooms of said Association for the present meeting of the Car-Painters; and also thanking the reporters and others, the Convention adjourned to meet in Philadelphia, Sept. 21, 1876.

Iron and Steel Rails.

THE Bulletin of the American Iron and Steel Association reports the following as the rail production of the United States for 1874, in net tons:

New iron and Bessemer steel rails over 40 lbs	349,978
New iron rails under 40 lbs	32,480
Rerolled iron rails of all sizes	323,035
Steel and steel-headed rails other than Bessemer	17,181
Street rails	6,739
Total	729,413

Of this, 259,288 tons were made in Pennsylvania, including 55,488 tons rerolled; 125,103 in Illinois, including 51,234 rerolled; 82,561 in Ohio, and the residue distributed among 16 States.

The whole number of rail rolling-mills in the United States in 1874, was 91, of which 57 make heavy rails mainly, and 34 make only light or street rails. Of the whole 91 mills, 22 made no rails in 1874. The product of the year was therefore rolled by 69 mills, and many of these ran only a part of the time. The capacity of all the rail rolling-mills of the country is at least double the product of 1874, which was 729,413 net tons. Of the 67 mills which made rails in 1874, 7 made both iron and Bessemer steel rails, 1 made Bessemer steel rails exclusively, 2 made steel-headed rails exclusively, 2 made steel-headed rails and iron rails, and 1 made solid cast steel rails and iron rails.

It will be observed that almost one half of the total rail product of 1874 was composed of old rails rerolled. The proportion of old to new rails was almost exactly the same in 1873. Of the new rails produced in 1874, 144,944 net tons, or more than one-third the total quantity, were of Bessemer steel. The product of street rails in 1874 was much less than in 1873, being 6739 net tons in the former year, against 9430 tons in the latter year.

The following table shows the production of each of the rail-making States during the past four years. In 1872 the production of street, mine, and light rails is given in the aggregate, but in the other years it is incorporated with the general rail product of the several States. It will be seen that Pennsylvania maintains her place at the head of the list, and that during 1873 and 1874 Illinois has ranked next to her.

States.	1871.	1872.	1873.	1874.
Pennsylvania	335,604	419,529	328,522	259,288
Illinois	91,178	106,916	136,102	125,103
Ohio	75,782	121,923	130,326	82,561
New-York	87,022	82,457	59,764	46,979
Maryland	44,941	26,472	42,356	48,008
Wisconsin	28,774	37,284	39,495	29,680
Massachusetts	28,864	29,242	34,034	24,765
Indiana	12,778	23,893	26,579	20,617
Maine	13,383	14,058	16,500	14,650
Missouri	8,200	15,500	14,020	24,017
Tennessee	9,667	14,620	13,973	13,693
New-Jersey	6,700	9,185	13,749	3,537
Kentucky	6,000	4,000	11,386	6,068
Georgia	7,840	6,930	8,275	8,061
Michigan	14,000	9,883	4,433	2,448
West-Virginia	5,000	20,100	4,000	522
Vermont	....	...	6,088	10,400
California	....	....	475	7,016
Kansas	....	....	....	2,000
	775,733	941,992	890,077	729,413
Street, mine, and light rails	....	58,008	...	....
Total	775,733	1,000,000	890,077	729,413

The total importation of new rails in 1874 was as follows: Of iron, 7796 net tons; of steel, 100,486 tons; total, 108,282 tons. The total production was 729,413 tons, of which 144,944 tons were steel. The probable consumption of rails during the year was therefore 837,695 net tons, against 1,148,850 tons in 1873, and 1,530,850 tons in 1872. The importation of old rails in 1874 did not greatly exceed 5000 tons.

The following summary shows the sources of rail supply during these three years, in net tons:—

Rails of all kinds.	1872.	1873.	1874.
Production	1,000,000	890,077	729,413
Importation	530,850	258,773	108,282
Consumption	1,530,850	1,148,850	837,695

Our exports of rails during the past four years have not been sufficiently large to affect appreciably the above figures of home consumption. They were as follows in net tons: 1871, 333; 1872, 1212; 1873, 375; 1874, 1257.

THE Centennial Board of Machinery has issued a set of rules and regulations for the guidance of exhibitors in the machinery department. All articles for exhibition in the machinery building will be admitted from January 5th to April 10th, 1876; all heavy and bulky machinery must be set up by April 20th, and all other not later than May 1st, Manufacturers of steam boilers, after notifying the Bureau, are required to deliver their exhibits before March, 1876, all of which must be previously subjected to a hydrostatic test in order to be accepted.

The Recent Car-Builders' Convention—Discussion on Car-Axles and Wheels.

BY J. M. BLANCHARD.

PRESUMING that the members of the Master Car-Builders' Association who annually meet in convention, do not desire entire immunity from criticism, I propose to jot down some reflections, suggested by a perusal of the report of their proceedings at their meeting in June last, and especially that part relating to axles and wheels. I would refer, in the first place, to the following question, which was presented for discussion, but which failed to elicit any direct or satisfactory answer:

"What may be considered the lifetime, or the mileage life, of a strictly No. 1 car axle, hammered from scrap?"

It is difficult to conceive how such an answer could have been made to an inquiry so indefinite in its character. Had the conditions of service been specified, including the kind of car, whether passenger or freight, the weight of same, the rate of speed, average condition of track, etc., it would have been possible to give an intelligent answer, provided the proper data had been at hand. That these leading conditions enter into the case will hardly be denied, to say nothing of other considerations, such as the material of the boxes, the quality and quantity of the lubricant, the accuracy in fitting, and the care taken of the axles when in use. It is evident that if a passenger-car is run only during the summer, or when there is no frost in the ground, its axles will show a greater mileage than when run in the winter, for the reason that in the former case the track is more yielding, and, consequently, the axles will be liable to less granulation than in winter, when the ground is solid. Another very important element is the amount of load carried. The members who took part in the discussion are all of them intelligent and experienced railroad men, who know that an axle carrying ten tons is subject to more strain and friction, and, consequently, to more wear and liability to breakage, than one carrying two-thirds that weight. The strain upon the axles is also determined, to a great extent, by the rate of speed and condition of track, the weight resting upon them being constant.

Mr. Somerby remarked, during the discussion, that his orders were not to use an axle under passenger-cars after it was two years old. To this Mr. Chamberlain replied, that on his road there were some cars that made only twenty-four miles a day, while others run 12,000 miles per month; that if the axles under the former were changed once in two years—taking that as a criterion—he would be going very far astray. He thought there should be some discrimination in such cases.

The question was doubtless framed in haste, and for the purpose of drawing out the views of members on the general subject; but in its terms it is not sufficiently clear and explicit to be distinctly understood by all, still less alike by all, either in the convention or out of it.

On the third day of the session, a report was called for from the Committee on Car-Wheels, but it was not forthcoming. In the absence of a report, Mr. Chamberlain remarked that he hoped members would discuss the subject; that he had seen the replies made to the circulars of the committee, and judging from these replies, he thought the committee would have had a hard time in getting up an A No. 1 report; but if the members would take hold the coming year, and introduce the mileage system on such cars as they have absolute control of, some valuable information might be expected.

Now, it is a matter of regret to a great number of people outside the convention, that no report was made by the committee on this most important subject. It is a subject in which railroad managers and stockholders are especially interested, and inasmuch as the members of the Master Car-Builders' Association have, by their own acts, constituted themselves a public body, their proceedings in convention are entitled to public notice. Had the committee made a report of such a character as to invite friendly criticism, such criticism would not have been detrimental to the interests of the Association, as it is manifestly for its advantage to know how its acts are regarded by the public.

In the progress of the discussion which ensued, Mr. Chamberlain presented some statistics in reference to steel wheels, which it would be profitable to quote and comment upon, did our limits permit. Suffice to say, he made a very good showing for such wheels. Mr. Davenport favored iron wheels, and proceeded to show that in some exceptional cases they had made a mileage as high as 200,000, and that some of these identical wheels were still in use. He maintained that the reason why the average mileage of cast iron wheels was not greater was owing to imperfect manufacture; some would take a better chill than others, while some would be perfectly solid on the tread, and others more or less honey-combed. In his advocacy of iron wheels, Mr. Davenport seems to have exhibited considerable feeling, which, under the circumstances, is to be regretted, as the subject was one of universal interest, and should have been discussed solely with the view of ascertaining which of the two kinds of wheels were the safest for the public and the most economical for the roads. Mr. Chamberlain points out some of the difficulties in the making of steel tires. Heretofore the steel was not perfect; but he assures us that now the ingots of which the tires are made are solid as can be, and perfect in all their parts. If he is right in this—and there is no reason to doubt that he is—he has established a point in favor of steel-tired wheels which the advocates of cast iron ones can hardly overcome, especially when we take into consideration the known difficulties connected with the making of the latter kind, and the admission of Mr. Hildrup that he had been engaged in their manufacture for twenty-five years without being entirely satisfied with the result.

Mr. Chamberlain also makes another important point in favor of steel wheels, when he says he introduced them last winter on the New-York and Boston express line, and as yet there had not been a failure, although some of them had run 90,000 miles, while previously there had been broken on the road upward of forty iron wheels per month.

Up to this point the discussion had developed facts of great interest to the public and to the owners and operators of railroads, the only regret being that more facts were not presented, and that any thing should have been said that savored of personal feeling. It is obvious that if any permanent good is to result from discussions of this kind, the members who take part in them should be ready to modify any preconceived notions they may have formed when facts and the weight of evidence seem to require it.

A question very pertinent to the subject was raised by Mr. Myers, as to whether steel wheels caused more wear upon the rails than iron ones. Every railroad man should thank Mr. Myers for raising this point, as it is one which must be definitely settled before the relative economy of the two kinds of wheels can be known. Mr. Adams, in reply to the question, said it was a matter that had not come under his observation, and he could not give any definite answer. This is not at all surprising, as it may well be doubted whether any one is prepared to answer it from absolute knowledge, because steel wheels have not been used a sufficient length of time in this country to afford reliable data for an answer. I will venture a suggestion of my own, however, in regard to this particular point, with the view of directing attention to the subject, and with the hope that the wheel committee will have something to say about it in their next year's report. It will probably be found that with the use of steel wheels, the inside of the head of the rail will wear faster than it would with iron ones, owing to the fact that abrasion is more likely to take place, because the steel is not as hard as the chilled portion of the cast iron wheel; but for the same reason it is certain that the upper surface of the rail will not be injured to the same extent as it would with iron wheels, as the tendency to lamination will be very much reduced.

It is to be hoped that the information obtained by the committees of the Car-Builders' Association before its next annual meeting, upon these and kindred subjects, will be so full and so well arranged as not to invite even friendly criticism, but only commendation.

English and American Railways.

MR. YOUNGHUSBAND, a prominent English civil engineer, who has given much attention to our railroads, thinks they are not to be compared with those of England, either in point of comfort, convenience or speed. The rapid growth of this country, and the pressing demands for rapid transportation have been so great and so far beyond the actual ready capital with which to build, that immense lines have been stretched across the country, whose sole excellence consists in the speed with which they have been put in so-called working trim. This fact alone, is enough to prove that the roads are not so substantial or complete as those in England, where the lines are comparatively short, the capital to build them inexhaustible, and the care, skill, and time bestowed upon their construction, fully commensurate with the necessities of the case. Such a thing as bridges being washed away, and fills and culverts destroyed, is almost an unheard of calamity in England, and trains are seldom ever delayed from any other cause than occasional negligence upon the part of the employés, which can not always be provided against. Here, nothing is more common than to hear of bridges swept away, and the tracks on our most traveled roads so much damaged by floods, as to stop travel by them entirely.

The reason of this difference, Mr. Younghusband says, is because here, a few piles suffice for the foundation upon which the abutments of most railroad bridges rest, and culverts are generally built with an eye more to cheapness than permanence, while in England piles are never used where the work is desired to be permanent. In place of these, the masonry of the abutments is built directly upon cast iron or cylinders, which are permanent in their nature, and never sag or sink, as piles driven in the ground very frequently do. And the masonry, too, is always of the first quality, regardless of time or expense.

Here it is too frequently the case, that the stone is not only of an inferior quality, but the work of putting it together is pushed ahead so rapidly, that it is oftentimes carelessly done, and while presenting a massive appearance, barely more than sustains its own weight. The roads here are rough with long and heavy grades; there they are as nearly level as the most perfect engineering skill and the most lavish expenditure of time and money can make them. Here a trip by rail is a task, which one shirks, notwithstanding all the boasted comforts and conveniences of palace coaches and sleeping berths; there it is a recreation and a pleasure.

The system of compartments in coaches in vogue upon English railroads, Mr. Younghusband claims as a great improvement upon the American railway coach. These compartments are adapted to seat eight persons comfortably, and each compartment has two doors, by which, in case of accident, an easy and quick exit can be had. The American coach seats from fifty to one hundred people, packed like sardines, who have only two doors to get out at in case of accident. Upon the whole, in Mr. Younghusband's opinion, English railroads are in all respects incomparably superior to those of America.

AWNINGS can be rendered waterproof by plunging the fabric into a solution containing twenty per cent of soap, and afterwards into another solution containing the same percentage of sulphate of copper. Wash and the operation is finished.

Passenger Car-Roof Construction.

To the Editor of the National Car-Builder:

DEAR SIR: A writer in the *Railroad Gazette* of Sept. 4, condemns in unqualified terms the present method of constructing the roofs of passenger-cars. He objects to the use of iron carlines, shaped as they usually are to conform to the requirements of the monitor roof, as a bad principle of construction, having little strength for the amount of material employed, and as being designed to produce a certain effect for mere appearance and display. Whatever force there may be in these objections, it would practically amount to nothing unless some better method were proposed to take the place of the present one; and so the writer proposes a form of roof construction as shown in the diagram, in which the rafters are carried straight from the plates to the corners of the raised roof, crossing in the center. This he contends would be more in accordance with correct architectural principles, make a stronger roof, dispense with the necessity of headlinings and other questionable devices for hiding the real character of the roof-framing, besides being cheaper and lighter and more pleasing to the eye.



Now all this looks very well on paper, and it will doubtless cause many people to wonder why such a very desirable improvement has not been thought of before, when in truth it *has* been thought of and rejected for very sufficient reasons. Almost every one knows how the old flat-top car has gradually been changed into the present style with the monitor roof. It was a change to meet the demand for more room, better ventilation, and a more tasteful style of ornamentation in the form of mouldings and head-linings, all of which have tended to increase the comfort as well as the number of passengers. One important requisite in connection with the raised or monitor roof, is that the space within it shall be as free from obstruction as possible, so as to present a clear view from one end of the car to the other. Bell-cords and lamps are, it is true, obstructions, but they are confined to the center line, where they are far less objectionable than if they interfered with the view on either side, as the crossing of rafters certainly would. It was to secure this unobstructed space along the monitor side-lights, that the iron carline was introduced to give the roof stiffness and support, and it has certainly served its purpose very well. It is adapted to a specific want, and to the needs of a peculiar structure which the old Gothic architects, to which the writer refers, knew nothing about. The roofs which they constructed of such skillful and cunning frame-work, belonged to massive and enduring structures designed to stand for ages, while a railway-car is a temporary, short-lived vehicle running on wheels and liable to be utterly demolished with scarcely a moment's warning. It is very well in the making of car-roofs to adhere as far as practicable to correct architectural principles, and avoid whatever savors of deception and trickery; but whatever feature is introduced, whether in the way of construction or decoration, must be subordinated to the character and uses of the vehicle, and these, as respects railway-cars, are specific and limited.

The writer referred to, thinks the iron carline device for sustaining a roof is so essentially bad, that he is not surprised that car-builders do all they can to hide it, while at the same time they point with pride to the effect produced. Now considering the nature and uses of the vehicle, if the effect is good, if the eye is gratified, if the occupants are made more comfortable, with no danger of the roof giving way for the want of adequate support; if there is no excessive cost, or waste of labor or material, why should not the builders be satisfied with the effect, and even pride themselves in their work? Methods of framing are not necessarily bad because they are covered up. The studs and joists of the finest houses are covered with plastering, and this again with fresco paint or wall paper; and locomotives even are partially covered with sheet iron. This is mainly done for the sake of appearance. There is no deception about it. The wall paper, like the head-lining of a car, is taken to be what it really is, the paint is understood to be paint, and the boiler-jacket sheet iron. As regards economy, my experience as a car-builder enables me to say that the proposed innovation would be more expensive than the present method. The wood, whether varnished or painted, would require a more or less elaborate finish, and this with the painting and varnishing, would cost more than ordinary head-linings, and without any thing gained in effect unless it might be to show the passengers how the roof was constructed. The present smooth, open finish would be superseded by a net-work of braces, too near the eye to be agreeable, obstructing the view, and affording a lodgment for dust. The idea of dispensing with head-linings is doubtless derived from the style of finish common to street-cars, and which is in keeping with the other well-known features of these uncomfortable vehicles, conveying to the unhappy occupants no idea of comfort or luxury except a negative one. Every thing is hard, plain, and economical, with no mitigating accompaniment except the holding-on straps, which enable one to stand up when he can't get a seat. Now I am inclined to think if the writer in the *Gazette* should enter a drawing-room coach for a day's ride, with its roof finished street-car fashion, he would modify his views somewhat, if he did not make up his mind to endure the iron carlines and flashy head-linings a while longer.

That there has been, and still is, a great deal of bad taste exhibited in the ornamental finishing of passenger cars both inside and out, is quite obvious. This, with other extravagances in construction, has very naturally resulted from rivalries between competing lines, and will in time correct itself; but there is little prospect that all meretricious ornament will be laid aside, in order to show the anatomy of the framework of the roof or of any other part of the car.

CARLINE.

Texas; its Railroads, Products and Physical Features.

DALLAS (TEXAS), Sept. 1875.

To the Editor of the National Car-Builder:

DEAR SIR: For some months past I have been prospecting in this immense territory of magnificent distances and growing population, and I send you herewith some rough notes of what has fallen under my observation with respect to its railway enterprise and productive resources. Aside from grain, cotton and live stock, there is in many places an indigenous crop of less desirable products in the shape of musquitoes, centipedes, reptiles and swamp malaria, which at this season of the year are constantly reminding carpet-bag adventurers that this climatic Eden has its drawbacks, like the paradise of old. These tormenting pests, however, like the aboriginal red-skins, are bound to diminish year by year, as the prairies and timber lands are brought under cultivation and towns and cities enliven the solitary wastes. It has been reported that Texas and California are the only States that have not felt the pressure of the hard times inaugurated by the panic, but I feel constrained to say that so far as Texas is concerned, the report needs confirmation. While there may not be the same degree of depression in the industries peculiar to this region, as there has been and is in the mercantile and manufacturing pursuits of the more populous north and east, the times here are by no means flush in a business point of view. Vagabonds, tramps and dead-heads are less numerous perhaps, for the reason that the working classes are more scattered, and the people as a rule less tolerant of able-bodied drones and mendicants.

Dallas is the metropolis of northern Texas, and has a population of about 20,000. It is situated at the intersection of the Texas and Pacific and Houston and Texas Central Railroads, and with respect to the latter, it is the dividing line for the products that go north to Missouri and south to the Gulf, about ten per cent more going north than south. A large share of the grain and live stock raised in this vicinity is shipped by the Texas and Pacific. Denison is the northern terminus of the Houston and Texas Central, at which point it connects with the Missouri, Kansas and Texas. This town is the infant wonder of the southwest. It is scarcely three years old, and has a population of 5000 recruited from every point of the compass and exceedingly diversified in character. Although the elements are a good deal mixed, they naturally coalesce and form a thriving and industrious community. The M. K. & T. Road has shops here for locomotive repairing, and facilities will before long be provided for repairing cars, which will save the expense of sending them to Sedalia where the general shops are. At present, only the necessary repairing for both roads, in order to keep cars on the track, is done here. A new union depot has been erected for the use of the two roads, and there are also extensive stock-yards to accommodate the great number of cattle shipped from here, averaging about 250 car loads per week. The northern shipment of grain is on the increase, and since the season opened, up to the first of this month, some 500 car loads have been shipped, being the product mainly of northern Texas. A good deal of this will be returned in due season in the shape of flour for local consumption.

There is a little rivalry, friendly of course, between Denison and Sherman, the latter a station a few miles below, at the junction of the Transcontinental Branch of the Texas and Pacific; but the former place so far takes the lead. The first bale of cotton of the season was sold at Denison on the 20th of August. Both places offered extravagant prices for it, and it was run up to 17 cts. per lb. The event was celebrated by the Denisonians by parading the bale through the town with bonfires and music, and then shipping it to St. Louis in gilded bands and fine linen. The traffic in the staple, however, is mainly confined to the southern portion of the State, where it is an important item in railway transportation.

At Corsicana are the machine shops of the standard or narrow-gauge portion of the H. & T. C., also the office of Mr. M. G. Cary, the assistant superintendent, one of the ablest railroad men in the west. At Hearne the narrow gauge commences, and cars going through have to be transferred to other trucks. This is done by one of Skinner & Gifford's transfer hoists, by which 100 cars a day can be transferred with the aid of four men. The Pullman sleepers run through from St. Louis to Houston, and passengers not accustomed to the transfer process, especially at midnight, are very much disturbed by the pandemonium of noises which usually attend it. From this point the traveler enters upon the low and level lands of southern Texas, and upon every hand may be seen extensive plantations of the "fleecy monarch." There is an absence of the tidy and thrifty appearance of the farms noticeable farther north, which indicates that you have passed the line which separates the two systems of agriculture which characterize the Northern and Southern sections of the country. The influx of northern energy into this region is doing much to obliterate the distinction which has heretofore existed in this respect, and as industry becomes more diversified, and railroads and manufactures are extended, it will eventually disappear altogether.

At Hempstead, fifty miles north of Houston, is the junction of the Austin branch, a valuable feeder to the main line, and furnishing it with a large amount of cotton. The country along this branch seems to be well adapted to sheep-raising, especially the high-

lands around Austin. The business has become quite extensive, and is yearly on the increase. The original stock is principally from Vermont and New Hampshire, the animals coming through without change of cars. They are fed and watered in transit, the cars being arranged specially for the purpose. I would also mention, with respect to the general traffic of the line from Houston to St. Louis, that there is an increasing product of coal derived from the Indian Territory; and during the fruit season, large quantities of melons, bananas, and peaches are shipped to northern markets.

Houston has a population of about 28,000. The headquarters of the company are here, including the general superintendent's office, and car and locomotive departments. All new or re-built rolling-stock is made to conform to the 4 ft. 8½ in. gauge, and it is expected that the wide gauge portion of the line will be reduced to the standard width during the coming year. I notice that the heads of departments on the roads in this vicinity are mostly Northern men, and also young men, who bring with them valuable experience acquired by regular grades of service and promotion on Northern roads. They are necessarily familiar with the best machinery and appliances for railway operation, and the result is that these indispensable requisites find their way more readily into Southern shops and with great benefit to the road service.

I must not omit to mention that the Texas and Pacific Road has in use a continuous drawbar, similar in its construction to the one devised by Mr. Griffith of Cincinnati. It works well, and I hope to be able to send you a drawing and description of it at an early day. MACK.

The Wearing Powers of Steel Rails.

THE Cincinnati *Times* has the following on this subject:

The continued depression of the iron interest, not only in this country but in Europe, is a subject for thoughtful consideration. The wonderful growth of the iron production of the world from 1835 to 1865 marked it emphatically as the iron age, and during that period was built almost our entire present system of railroads, covering over 73,000 miles of track, and requiring fully 7,300,000 tons of railroad iron in its construction. The annual wear and tear, estimated at about 10 per cent., would require 730,000 tons per annum of railroad iron. Since 1865 Bessemer steel rails have been growing in favor and decreasing in cost, and to-day the Bessemer plants of this country are capable of producing 350,000 tons of steel rails per annum. When it is remembered that each steel rail possesses fully seven times the life of an iron rail, is it to be wondered at that so many of our iron rail mills are changing their production to merchant bars? Every ton of Bessemer steel rails that has been put into the railroads of the country for the past ten years has possessed a wearing life, as compared to iron rails, as 70 to 10. It requires very little calculation to estimate the required production of steel rails, not only to cover the entire wear and tear of all our iron roads, but in a few years to replace our iron roads with steel rails.

When this is accomplished, there will only be required 73,000 tons per annum to supply the wear and tear that in 1865 required 730,000 tons of iron. This will account in part for the decreased production of pig iron in the country for three years past. In 1872 there were produced 2,854,558 tons of pig iron; in 1873, 2,869,278 tons; and in 1874, 2,689,413 tons, a falling off of about 16 per cent. in the production of pig iron in two years. This was fully equalized by the low wear and tear of the steel rails that had gone into the railroads since 1865.

We are now entering on the steel age, and the iron men of the country must meet the question firmly, understanding not only that the market for railroad iron is almost at an end, but that whenever Bessemer steel supplants the use of wrought iron, it not only requires less weight for a given result, but that, the life of steel being so much longer than iron, the wear and tear will be proportionately less. England, France and Belgium have already recognized the sovereignty of the new metal, "Bessemer," and are now changing their works to meet the emergency. Shall our iron and steel men, with their justly won laurels for the great production with the Bessemer plants, allow others to step in and rob them of their glory?

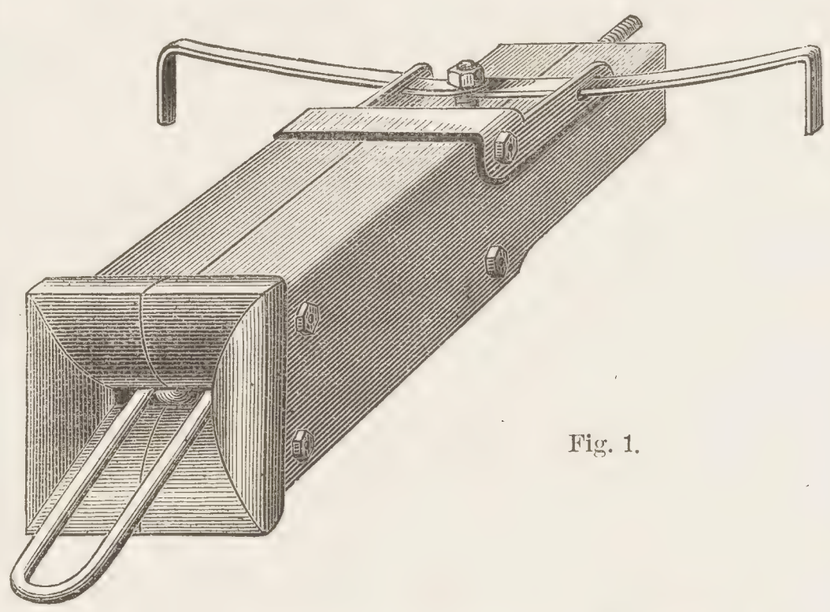


Fig. 1.

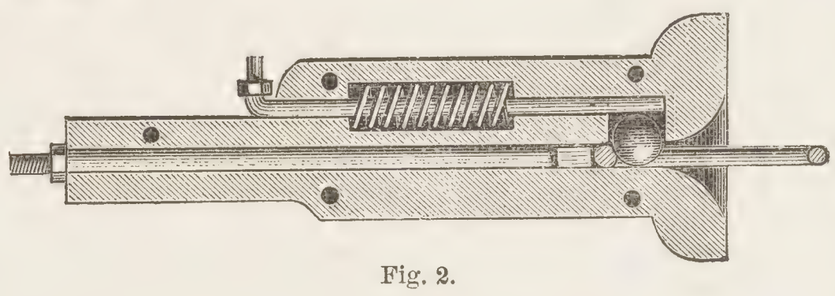


Fig. 2.

The Eccleston Ball-Coupler.

THE cuts represent an alleged improvement in coupling cars, of which Mr. N. B. Eccleston, of Oxford, N. Y., is the inventor. The draw-head, as shown in Fig. 1, is in two sections held together by bolts. Fig. 2 shows the interior arrangement by which the coupling is effected, the peculiar feature of which is the use of a ball instead of a pin to hold the link. A latch-bar, kept in place in the recess over the ball by means of a spiral spring, causes the ball to engage with the link and hold the cars together when the draft-strain is applied. To uncouple, the latch-bar is drawn back by the action of the levers as shown in Fig. 1, which allows the link to be disengaged by forcing the ball up into the space left by the withdrawal of the bar. In this condition it is also ready for coupling, which is effected automatically by the striking of the link against the ball and lifting it so as to allow the link to pass.

We know nothing of the practical working of this device. It would seem to dispense with the pin, but retains the link. The ball is held fast in the recess, so it can not well be lost. We illustrate this arrangement as showing one of the innumerable plans for coupling cars.

Training Men to Run Locomotives.

A WRITER in the *Locomotive Engineer's Journal* says: "To keep men firing three or four years I consider wrong, from the fact that in that time the business becomes distasteful to them, and they lose what little ambition they had in the beginning. A fireman should go on the road one year, or long enough until he learns how to fire. From the road into the 'erecting'-shop for one year, and there be thoroughly instructed in the use of tools, how to take down and put up machinery, and the mysteries of valves. If, at the end of his second year, he shows considerable proficiency in shop work, let him return to the road, as a graduating fireman, under instruction in running and managing a locomotive engine; at the same time, he should be put on with a man who is master of his business, and who will thoroughly instruct him in the thousand and one little things that can only be learned on the road. At the end of the third year, if he shows the necessary skill, let his master-mechanic give him a thorough examination in valves, the construction and running of a locomotive, and how he would act in cases of doubt and uncertainty on the road; if the candidate don't come up to the company's requirements, let him be dropped from the rolls, or return to the road as an ordinary fireman. If he passes a successful examination, return him to the road for promotion. Firemen, while in the shop, should be in a gang by themselves, under the instruction of a competent locomotive engineer and machinist. I believe the above to be the only method whereby the coming engineer will be master of the situation."

Old Mrs. Quince and the Railroads.

WHEN railroads were first introduced into this country, this venerable lady declared in a very positive manner that they were a dangerous thing, and she would never take a ride in the cars "no how." She was suddenly called in the month of April to visit a friend who was living some thirty miles away. The roads were impassable, consequently no stages were running. She must either go by rail or remain at home. Her family tried their very best to influence her to take the cars, and finally succeeded.

Accordingly she was accompanied to the depot by her son-in-law, James Smith. He purchased her a ticket, and seeing her comfortably seated in the cars, exhorted her thus: "Now, mother, please make up your mind that, no matter what may occur, you will keep cool. The cars start suddenly, and they stop suddenly, and they pitch around and jerk tremendously sometimes; but don't be disturbed, just make up your mind that you won't be. Now, mother, please promise me that you will keep cool, and then I shall have no fears about you."

The old lady could not resist this plea, so she promised, fully determined that nothing should be allowed to trouble her. James bade her good-by, and the cars started. They went along very pleasantly for quite a while, and Mrs. Q. thought that riding on a rail was not so dreadful, after all. They had gone about sixteen miles, and were flying along at a fast rate. Passing through a deep cut, there was a curve in the road, and an immense rock had fallen from the ledge and landed upon the track; the engineer did not see the rock in time to stop the train, consequently a collision followed, which pitched the old lady over three seats.

She gathered herself up, and smiling very complacently, again took her seat. After a while, the rock was removed and the train started on. The conductor, passing through the train, noticed the old lady looking so calm and composed, and remarked, "Madam, we came very near having a fearful accident." "Did you?" said the old lady, smiling. "Yes, it was a serious collision." "Have you had a collision?" she asked, in her sweetest tones. "Why, yes!" thundered the conductor, "didn't you notice how suddenly the cars stopped?" "No," said the old traveler quietly, "I didn't notice it; I thought that was the way they always stopped!"

THE Palace Hotel, now nearing completion in San Francisco, is the largest hotel structure in the world. It covers 96,250 square feet of ground, and is seven stories high; 24,661,000 bricks were used in its walls, 3,000 tons of cast and wrought iron, and 4,561,524 feet of lumber and timber. It contains 1,060 windows, 337 of which are bay windows; 926 rooms, none of less size than 16x16 feet, and 388 bath rooms. It contains over three miles of halls; there are five passenger elevators and seven grand stairways; there are 4,540 doors, 9,000 gas burners, and thirty-two miles of gas and water pipe. It requires 50,000 yards or twenty-eight miles of carpet. It can accommodate 1,200 guests, besides 360 servants and employees.

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OCTOBER, 1875.

Editorial Announcements.

CORRESPONDENCE.—*We cordially invite the co-operation of the railroad public in affording us the material for a good mechanical paper. Articles relating to rolling-stock and machinery, by those practically acquainted with those subjects, will be gratefully received. All communications must be addressed to Vose, Dinsmore & Co., No. 32 Warren Street.*

ADVERTISING RATES.—*For one square, or one fifth of a column, $5 per month, or $50 a year. For half a square, $3 per month, or $25 a year. Larger advertisements by special contract.*

All communications in regard to advertising should be addressed to L. F. DINSMORE, *Post-Office Box* 4055, *New-York City, who is our agent for advertising, and authorized to make contracts, collections, etc.*

ENGRAVINGS AND ILLUSTRATIONS.

We would invite the attention of Master Car-Builders and others to the advantages to be derived from publishing in THE NATIONAL CAR-BUILDER *engravings designed to illustrate the various features and details of car construction, and especially such improvements as can not otherwise be clearly presented. We will procure cuts to be made in the best manner from drawings or models that may be sent us, and charge only for the cost of engraving, inserting the same in our paper with suitable descriptive details, without charge.*

The Approaching Centennial.

IT is doubtless too soon yet to form any very definite idea of the character and variety of the articles to be exhibited next year at Philadelphia. That our domestic industries will be well represented is highly probable; but there are obvious reasons for supposing that the contributions from Europe will be limited both as respects quantity and variety. The occasion being a national anniversary suggestive of revolutionary reminiscences and redolent of 4th of July and the American eagle, it will naturally assume in the eyes of foreigners somewhat of a local and political aspect with which they have little concern. This, together with the distance to be traversed and the hazards of ocean transportation, will have its effect in limiting what is sent from abroad to such articles of merchandise and products of manufacture as will be likely to secure a market here. Those rare works of art in sculpture, painting, tapestry, wood-carving, jewelry, bronze and the like, which have no proper market or money value, and could not be replaced if injured or destroyed, are not likely to be sent here merely for temporary exhibition. So far as these are concerned, the display as a whole will be deficient in those elements of high art which constitute a leading and most attractive feature of the international exhibitions of Europe. Aside from these, however, there will no doubt be a sufficiency of the products of European industry and skill to enable us to institute comparisons with our own, and appropriate any benefits that may be derived therefrom. We have not yet excelled the old world in all the elements of material, social and scientific progress, although in some respects we may justly claim a superiority. The exhibition as a whole, will be an index of our own industrial progress as compared with its point of departure a century ago—a good point to count gains from, as the politicians say—for as a nation we were then numerically and historically at the foot of the ladder, with every thing to win and nothing to lose, so that relatively the exhibition of next year will be more significant and flattering to our national pride than any that is likely to be witnessed in future. It should be regarded as a milestone in our history, an inventory and record of progress, and not merely as a great bazar for the display of merchandise and the advertising of miscellaneous wares.

We do not know what steps have been taken to exhibit a representative collection of American railroad equipment, machinery, tools and appliances. No such opportunity will soon occur again to concentrate in one focus, as it were, all the features and characteristics of our system, differing as it does, in general and in detail, so essentially from European methods. Every car manufacturer and railroad company should make early preparations to send specimen cars, so that in the aggregate every description of car will be upon exhibition. There should also be a magnificent display of locomotives, not to mention the innumerable accessories of rails, axles, wheels, etc. Should a wise discrimination be exercised in excluding whatever is crude, unfit or impracticable, the resulting benefits will be correspondingly greater. It would also be exceedingly desirable to have a good representation of foreign railway equipment for purposes of comparison. The points of difference in the two systems are so numerous and striking, and involve so many unsettled engineering and mechanical problems, that to bring them side by side for scrutiny and inspection, would certainly be productive of much mutual benefit. The weight and bulk of rolling-stock and the expense attending its shipment are such, that we do not expect a very great display of foreign contributions in this line. There should be no meagre representation of our own, however; it should be upon such a scale that the members of our railway mechanical associations could afford to forego their usual annual discussions in convention, and devote the time allotted to them, and more too, to the exhibition, not as a matter of holiday recreation, but as downright, earnest, profitable, paying business.

We hope also there will be exhibited such relics of early railroad appliances and machinery as will serve to illustrate by comparison the progress that has been made. Many of these are still extant as objects of curiosity, becoming with age more interesting and valuable as souvenirs of the past. These comparisons are pertinent to the occasion, and are naturally suggested by it. If our grandfathers could have a temporary resurrection next year to witness the scene, they would be forced to admit that in their day they were a little slow and pokey, with their flint locks, and hand looms, and tinder-boxes, and wafer-sealed letters, and 7 x 9 newspapers. What did they know about modern improvements and fast life? what about needle-guns and fancy-stocks, municipal rings and glass ballot-boxes, shoddy cloth, lightning expresses, five-hundred-dollar church pews, paper collars, greenbacks, and all the paraphernalia of these wonderful times? What did they know about machinery? Why, they even milked their cows by hand; but now we have machines that will milk seven cows in five minutes, and the cows don't even know they are milked! What did they know about car-couplers, those indispensable fixtures that no well managed railroad can do without? In their childish notions of mechanism, they doubtless supposed that a simple link-and-pin arrangement for attaching one vehicle to another, could not very well be improved upon. But if they could be in Philadelphia next summer, or read the literature of the Patent Office for the last decade, they would find out their mistake. Instead of being a simple thing, they would discover that the proper coupling of railway cars is one of the most intricate problems of the age, and that fully one third of the enterprising male population between the ages of 15 and 65 are tormenting their brains day and night, to find out how to do it. It will be done, however; and if some of us could be permitted to look in upon Centennial No. 2, we should doubtless see cars coupled together by methods of which we now little dream—by chemical affinity, perhaps, or atmospheric suction—and as for safety! why the safest place in all creation will then be, in all probability, between a couple of freight cars at the moment they come in contact.

We say then let us have as many obsolete relics of railroad antiquity at the exhibition as can be got together—and we think the Baltimore and Ohio Railroad could supply many interesting ones from its scrap yards and the remains of its early equipment—and as we look at them with generous allowance for their almost ludicrous shortcomings, it should not be forgotten that many of the boasted devices of this present year of grace will in their turn take their place in some museum of antique rubbish a hundred years hence.

Recent English Experiments with Power-Brakes.

DURING the past few months, the English railway engineers have been conducting a series of experiments with power-brakes, with a view to determine their relative value and comparative efficiency. These experiments seem to have been conducted fairly and carefully, and are in some respects satisfactory; but their value has been impaired by certain errors which give the results more interest as general data respecting the short stoppage of trains, than as bearing directly upon the real problem to be solved. For some reasons it is a good thing that they have approached the subject as they have. Owing to the peculiar construction of their cars, and methods of making up trains, the English railway managers know very little about brake-power in its application to all the cars of a train. In view of this lack of knowledge, it was no doubt wise in the English engineers, to begin their experiments with tests calculated to direct their attention to the primary facts respecting brakes and their uses. In the testing of power-brakes, however, they have fallen into an error quite natural under the circumstances, and have sought to determine their efficiency by observing the effect of the brake-shoes upon the wheels; or, in other words, they have been experimenting to find out the best system of brake-hanging as applied to their carriages, instead of testing the efficiency of the different power-systems as applied to the hanging-gear. By so doing they have learned certain facts, from which they have drawn erroneous conclusions, since the experiments are yet to be made which will fairly test the several kinds of power employed, and its value in operating continuous train-brakes.

In all experiments with brakes, whether they are worked by power or by hand, certain elementary considerations must not be lost sight of, and these are: first, in stopping a train, each brake-shoe must be made to exert its maximum retarding power upon the wheel to which it is applied; secondly, there should be a shoe to every wheel; and thirdly, the retardation should be such as to bring every wheel of the train to the verge of "skidding." In this country our ordinary hand-brakes accomplish this result for each individual car; and any application of power to the brakes of a whole train, that does not secure such maximum retardation to the verge of sliding the wheels, is essentially defective. In American railway practice, no passenger car is considered properly equipped in the matter of brakes until this is provided for. This requirement is a standard of efficiency to which all power-brakes are expected to conform, as far as possible; and all successful inventors have made such standard the goal of their efforts in the improvement of car-brakes.

In the English experiments, however, it does not appear that any of the trains used in the tests were so fitted that such maximum retardation could be se-

cured ; and as a consequence they were calculated to determine much more the relative value of the various apparatus for the mere hanging of the brake-shoes, than the comparative merits of the several kinds of power used for the working of such apparatus. For these reasons, the experiments referred to are not properly tests of hydraulic, compression, vacuum, steam, or other methods of obtaining and applying power, but rather a trial of the rods, levers, and brake-beams. The points of a power-brake should be determined independently of the peculiar arrangement of these rods, levers, and beams, for these latter are presumed to be all right. What we expect of the former—that is the production, control, and application of the power—is simplicity, reliability, and an absolute immunity from derangement from causes likely to occur in the running of trains under ordinary conditions. These essential qualities seem to have been overlooked by the English engineers. It is safe, we think, to say, that as much or little power as may be required can be obtained from any one of the power-brakes in use. It is merely a question of so adapting the apparatus as to get all the power that is needed. But in rapidity of action, which is a vital point as affecting efficiency, we find wide differences. Some systems act so slowly that, though the stops may be quick, a considerable loss of time may attend the operation of throwing the brakes off. In others, we find the reverse of this ; the application of the power is slow, but the release of the brakes is effected quickly and without difficulty. These qualities, however, are of minor importance compared with simplicity of construction and durability. Machinery of any kind in operation upon a railroad train is constantly subjected to the severest usage. The inevitable concussions and continued vibration render complex machinery of any sort a constant source of anxiety and trouble to the car-builder and master-mechanic. One of the indispensable prerequisites of a power-brake is that it shall always be in order. The engineer must feel that he has in it a never-failing recourse in moments of danger. He should feel that it was better to rely wholly upon the hand-brakes, than upon a power-brake which would ever, or under any circumstances, fail ; and between a complex power-brake of maximum efficiency, and one less efficient, but at the same time less liable to become disabled, the choice would always be in favor of the latter. This also is a point which our English neighbors seem to have overlooked ; but until it is made a prime consideration, their experiments will not possess much value to practical railway managers.

In still another respect, the English experiments seem to have been at fault. From a careful reading of the reports, we reach the conclusion that they were so arranged as to develop the special excellence of one brake, rather than to fairly determine the comparative merits of the different systems. A much better method of trial than any which could be conducted experimentally, would be to put the systems most favorably regarded in this and other countries to the test of practical use upon regular trains. If this is done, and an exact record of cost, repairs, performances, and durability, is kept, we shall have a valuable contribution to the literature of a most important subject.

The Lightning Postal Trains.

THE event of the past month in railway enterprise has been the inauguration of the fast mail lines, between the East and West, upon the basis of a time schedule of 26 hours from New-York to Chicago, being an average of 38 miles an hour, including stoppages. This is such a decided step in advance of all previous achievements in rapid transit, that it is not surprising that crowds gathered at all points along the line to witness the first passage of the flying train. That such a speed can be maintained for so many consecutive hours, without interruption or accident of any kind to cause delay, is an evidence of the mechanical completeness of the running gear and the perfect adjustment of every detail to the service required. And when it is considered that this is not a mere exceptional and extra hazardous feat to be performed once, but a permanent thing to be kept up continuously in future, it may well be set down as an epoch in railway developement, the herald of greater possibilities yet to be realized. All our roads are capable of great improvement in structure, alignment, track room, crossings, signals, etc., by which distances may be shortened, and the facilities for higher speeds increased. It has been so in the past ; and judging of the future by the past, a state of things may be anticipated at no very remote period, when the marvelous feats of to-day will sink into commonplace, the mails be transported at a speed rivaling the telegraph, and the croak of the Granger no longer be heard in the land.

Committee on Hot Journals, etc.—A Correction.

THE names of the members of this committee are incorrectly stated in the list beginning on page 183 of the official report of the Master Car-Builders' Association. By reference to page 96, it will be seen that the committee was reconstructed, and now consists of Messrs. J. W. Holmes, of the Atlantic and Great Western, M. P. Ford, of the Pittsburg, Cincinnati, and St. Louis, and W. F. Smith, of the Cleveland, Columbus, and Indianapolis roads, the two last named gentlemen taking the place of Messrs. McIlwain and Steinbrunner who were on the committee last year.

The Cliff Elliptic Spring.

THIS improved form of elliptic, judging from the reports which come to us from the numerous roads now using it, continues to give increased satisfaction and is daily becoming more popular. The luxury of an easy riding passenger car is universally appreciated, and in order to secure this luxury to a degree of perfection not hitherto realized, the Cliff spring is indispensable. Since its first introduction, it has undergone some important modifications suggested by a careful observation of its practical working, but involving no change in the principle of its construction. It is now demonstrating its superiority in every respect to the ordinary, or old-fashioned elliptics, and should be placed under all passenger cars. They are also equally well adapted to locomotive tenders and freight cars.

A FUNERAL car designed for use between the Grand Central Depot and Woodlawn Cemetery, has just been completed by the New-York and Harlem R.R. Co. It contains a special compartment 12 feet long, with a folding platform in the center for the coffin. Around the platform are shelves for flowers. This room is elegantly finished in bird's-eye maple and mahogany. The outside of the car is painted green, and its entire length is 68 feet.

THE experimental tests of steam-boiler safety-valves commenced at Washington on the 13th ult., under the direction of a committee of the Board of Supervising Inspectors of steam-boilers.

THE Philadelphia and Reading Railroad Company have issued an order for the building of four passenger engines at the Reading shops. Each engine will cost from $15,000 to $20,000.

THE Ranlet Car Company at Laconia, N. H., is finishing up an order for cars for the Hoosac Tunnel Fast Freight Line, and has an order for 50 freight cars for the Boston and Lowell road.

COPIES of the Ninth Annual Report of the Master Car-Builders' Association are for sale at the office of the NATIONAL CAR-BUILDER, 32 Warren Street. Price 75 cents.

WE are indebted to Mr. Geo. W. Houghton, Editor of the *Hub*, for revised proof-slips of the proceedings of the Master Car-Painters' Convention.

The Lehigh Valley.

A FLYING trip made recently through this charmingly picturesque portion of Pennsylvania, has impressed us very favorably with its many attractive features, and we are not surprised that it is becoming every year more of a resort for city residents in pursuit of pleasure and recreation. It is easily accessible from New-York by the Central Railroad of New-Jersey and its Lehigh and Susquehanna Division ; and from Philadelphia, by the North Pennsylvania Railroad with its upper terminus at Bethlehem, on the Lehigh River, twelve miles west of Easton. The objective point for tourists is Mauch Chunk, which can be reached in four hours from either city. The town is situated in a narrow ravine through which the river passes, the space between river and mountain being barely sufficient for a single street with buildings only on one side. There is a large and commodious hotel, where visitors are provided with every desirable comfort and attention. The surrounding scenery is exceedingly wild and rugged, the entire valley, from the upper sources of the river to within a few miles of Allentown, being so closely hemmed in by mountains that it has been somewhat ambitiously termed the "Switzerland of America."

One of the leading attractions for visitors at Mauch Chunk is a ride on the Switch-Back Railroad. The round trip comprises a distance of 16 miles, and is replete with all the elements of novelty, adventure, and pleasurable excitement, especially if the weather is favorable. Visitors are conveyed from the hotel in horse vehicles to an elevation of about 200 feet, where they are transferred to an open car, seating about 25 persons, which proceeds a short distance on a down grade, until it reaches the foot of the first inclined plane, 2322 feet in length, and extending at an elevation of about thirty degrees to the top of Mt. Pisgah. The car is drawn up the incline by heavy iron straps, running on wooden rollers between the rails, and passing round a drum worked by stationary power at the top. Every precaution is taken to avoid the contingency of the car going down on the run in case of any breakage or derangement of the machinery. Such an occurrence would not only interfere with the regular time-table connections, but would be quite likely to make passengers sick who were not accustomed to ride backwards. From the top of this plane, which is 850 feet above the Lehigh River, the car proceeds westward, on a down grade of 50 feet to the mile, to Mt. Jefferson, a distance of a little more than six miles, where it ascends another plane 2070 feet in length, by the same means as above described. From this point it proceeds a mile further on to Summit Hill, the terminus of the road, having obtained a sufficient altitude to run itself back on a down grade of 96 feet to the mile to the point of starting. The entire trip is made in an hour and a half, and eight trips are made in a day. The road is leased and operated by the Central Railroad Company of New-Jersey, and is considered a very clever and successful piece of engineering. There are a number of other attractions in the vicinity of Mauch Chunk, in the way of glens, gorges, cascades, and such like peculiarities of mountain regions, but we have not the space to notice them in detail.

The products of the valley are coal, iron, and lumber, and considering the natural obstructions to be overcome, the present facilities for transportation are excellent, consisting of the Lehigh Canal, extending from Easton to a few miles above Mauch Chunk, the Lehigh Valley, and the Lehigh and Susquehanna Railroads, the latter being operated by the Central of New-Jersey. The coal traffic on these several lines is at present very active, and should it continue equally so the rest of the year, the aggregate tonnage will, it is thought, equal that of last year, notwithstanding the long-continued strike of the mining operatives.

The Central of New-Jersey has already acquired an enviable repute for the efficiency of its management. That its reputation is well deserved, must be manifest to the most casual observer who travels over the line. The roadway and rolling-stock are in first-rate condi-

tion, the trains move with promptness and regularity, and upon every hand there is evidence of thorough organization, competent and well-selected subordinates, and that careful and unremitting attention to details so indispensable to successful railway operation. Improvements are constantly in progress, steel rails are being substituted for iron, and a large portion of the Lehigh Division has been laid with double track. Another feature of this road, and especially of the Central Division, is worthy of special mention. We refer to the erection of attractive and commodious station houses, with surroundings of trees, shrubbery, and flowers, instead of neglected wastes of barrenness and rubbish. The present equipment consists of 242 engines, 182 passenger-train cars, 18,000 4-wheel coal cars, and several hundred miscellaneous. The car and locomotive repairing is mostly done at Ashley, near Wilkesbarre. The shops are under the supervision of Mr. L C. Brastow, the master mechanic of the L. & S. Division. They are substantial brick structures, with spacious yards and track room, and well equipped with the requisite mechanical appliances. As an index of the capacity of the shops and of the extent of the coal traffic of the road, we were informed by Mr. Brastow that 3500 coal cars passed through the shops for repairs during the month of August, and there was also a consumption of 144,000 feet of oak lumber during the same month. Here are also located the Lehigh and Wilkesbarre Coal Company's lands, which cover a large area, and in which the Central Railroad has a controlling interest, thus securing to the road a supply for transportation for an indefinite period in the future, independent of all other interests.

The collieries being in the Susquehanna valley a thousand feet or more below the high elevation over which the coal must be carried in order to reach the Lehigh, it has formerly been hauled some 13 miles, up heavy grades and around long "loops," to get it fairly started on its way to market. This is now accomplished with much greater cheapness and dispatch by means of inclined planes and stationary power. Three powerful engines are placed at the top of as many successive double-track planes running directly up the mountain. From 12 to 15 loaded 4-wheel cars are drawn up at a time, proceeding to the second plane as they reach the top of the first one, and so on until they arrive at the summit or top of the third plane. The cost by this method does not exceed 3 cts. per ton, while by the railway track, the cost was 25 cts. per ton.

The Lehigh Valley Railroad runs on the south side of the river as far as Mauch Chunk; above which it keeps mostly on the north side until it diverges toward Wilkesbarre. It has about 18,000 coal cars, and its coal tonnage for the last fiscal year was 4,150,659 tons. Its repair shops are located at various points—Wilkesbarre, Hazleton, Weatherly, Delano, Packerton, and South Easton. We made a brief visit to those at Packerton, a mile and a half below Mauch Chunk. They are under the superintendence of Mr. E. R. Brown, the master mechanic, who has been for many years connected with the road. They consist of a car shop, blacksmith shop, two round-houses, and a few other buildings of minor importance. About 600 men are now employed, the most of them in the building and repairing of cars. No passenger work is done. The wood-cutting machines are of the most improved description. We noticed one of somewhat peculiar construction, for cutting and tenoning the ends of coal-car sills; the stick, by the raising of a platform, is brought in contact with two circular saws, set at right angles, which do the transverse and longitudinal cutting, when it immediately meets the tenon-cutters above the saws, and the sill is then complete and ready for framing, the cutting being performed with great rapidity and accuracy. Our attention was also called to a machine for making washers, with an improved patent attachment, consisting of a double punch and die, one punch and die cutting the outside form and size of the washer, and the other the hole, each plunge of the machine turning out a perfect washer of any required size, ready for use, and at a great saving of labor as compared with the ordinary process. The method of keeping the time of the men is also worthy of mention. Each man has a number, and this is checked off on a sheet or printed blank as the man passes through a wheel-gate to his work, and another check is made in the same way when he leaves off. If he fails to report when he leaves off, the first check goes for nothing, and he gets no credit for the day. In this way there is no cheating or keeping track of names, as every man is known only by his number.

The works of the Lehigh Car and Manufacturing Company, at Stemton, near Catasauqua, are engaged in completing a lot of coal-cars for the Central Road. The works are very near the track, and consist of a wood-cutting, erecting, and blacksmith shop, all supplied with the requisite machinery for this class of work. In addition to car work, the company manufacture an improved style of wagon, so constructed that the forward wheels may be higher than the body is from the ground, and still pass under the body in turning. This is done by means of a roller attached to the body, and running on a kind of horizontal wheel or plane underneath, with elevated sides, so that when the forward axle turns, the body is necessarily raised sufficiently for the wheel to pass under it.

The car works of Frederick & Co., at Catasauqua, were engaged in filling some orders for gondolas, flat and box cars.

The New Fast-Mail Postal Cars.

A NUMBER of these cars designed for the lightning mail train of the New-York Central route, have been completed and are now running. They are fine specimens of construction, and in their external appearance present a marked contrast as compared with the ordinary passenger train cars. They were built at the shops of the New-York Central and Lake Shore roads, and consist of three styles or classes, one for assorting and distributing newspapers, another for letters, and a third, called tenders, for stowing through mail matter. The one for newspaper service is 60 feet in length, 9 ft. 8 in. wide outside of sills, and is mounted on six-wheel trucks. The outside, below the letter-boards, is painted almost a pure white, the letter-boards being a shade darker. In the center is a large oval raised panel bearing the name "Gov. Tilden," and on either side toward the ends, is a shield, one representing the national coat of arms, and the other a design with the Latin inscription, "Novus Ordo Seclorum." The letter car is 50 feet long and runs on four-wheel trucks. Both cars have Westing house brake attachments, Miller platforms and couplers, four safety-chains to each truck, and a Creamer safety-brake upon each platform which can be instantly applied by pulling a cord inside the car. Each car is lettered "The Fast Mail," and also with the names of the two roads, N. Y. Central and Lake Shore. There are two double doors on each side, and also two of Ward's Mail-Catchers for receiving mail bags at the various points without stopping the speed of the train.

The interior of the "Gov. Tilden" is fitted up with all the necessary facilities for assorting newspaper mail matter. These consist mainly of 94 chutes to which the bags are attached. The superintendent of the service has a compartment furnished with a desk and lounge. The letter-distributing car is fitted up with 946 letter-boxes; both are provided with Baker heaters and top ventilators. The platforms are inclosed with side-doors so that there is communication from one car to the other with but little exposure to the wind and weather. The lighting is by student-lamps. The letter-distributing car is named "Gov. Dix," and has the same ornamental features and general outside appearance as the "Gov. Tilden."

The tender-cars to which we have referred, are all 50 feet long, and painted pure white, except the friezes, which are a trifle darker. They also have four-wheel trucks, Westinghouse and Creamer brakes, Miller platforms, and Dinsmore springs on the equalizing bars. There are no inside fixtures except a double row of stanchions extending from floor to roof, and six candle-burners suspended from center of dome. The side-lights are wider than usual, and are continuous, without division panels, for the purpose of admitting as much light as possible. These cars are named after the present and recent Governors of New York, Ohio, Pennsylvania, and other States contiguous to the line of transit, and were built at West Albany. The others were built at Cleveland and Adrian.

The Pennsylvania Railroad Company has also organized a fast mail express, which commenced running about the middle of September between Jersey City and Chicago, on a time schedule of 26 hours. It is called "The Limited Mail Train," and consists of three letter and newspaper cars and three tenders. The former are 64½ feet long, and 9 ft. 4 in. wide. The interior fitting up is similar to that of the New-York Central cars, and consists of distributing pigeon-holes with reversible bottoms, for letters, and larger ones for newspapers. There is also an office in each car with a bed-sofa, writing-desk, etc. The outside is painted pure white, varnished, and lettered with gold leaf. There is an oval center-panel representing the consulate seal of the United States. They are equipped with Westinghouse brakes, six-wheeled trucks, check-chains, and all necessary appliances for safety and efficiency. The general finish both inside and out, is less elaborate than that of the cars of the northern competing line; but this can scarcely be wondered at when the time occupied in their construction is considered. The three postal cars are entirely new, and were built at the Altoona shops inside of two weeks, the order for them being given at the shops on Saturday, August 28th. On the following Wednesday all were erected and received a coat of paint, and by Friday evening were ready for the track. On the next morning, September 11th, they left for Jersey City, running to Harrisburg, a distance of 132 miles, in 3 hours and 26 minutes without a stop, and from thence proceeding to their destination without detention or heating of journals. The subsequent running also proves that the quality of the work was none the worse for the marvelous rapidity with which it was done.

THE Illinois Central Railroad is building at its Chicago shops, 50 box cars for the Chicago, Cairo, Arkansas and Texas through line. The bodies have iron transoms; the trucks are the standard road pattern, 54 inches from center to center of axles, with swinging bolsters. The cars are transferred to the wide gauge tracks of the Iron Mountain Road at St. Louis, and from these again to the standard gauge upon reaching Texas. In addition to this work, there are 15 passengers cars in the shops undergoing repairs and repainting. The entire passenger equipment is repainted and renovated every ten months. The standard color for passenger and baggage cars is a light yellow. The ends of one of the latter are being painted a dark shade as an experiment, to prevent showing dirt. A new coach is also building to replace No. 54. It is 44 ft. 6 in. long, 9 ft. 8 in. wide, and 9 ft. 2 in. from floor to monitor roof. The ventilation is by end-sashes which admit the air from under the hoods. In winter the air is admitted from the roof and passed around the stoves, and from thence into the car by means of tin tubes, 2 x 8, with five perforations on each side. The inside is finished in walnut and ash, and the windows are set low to admit of double sashes. A peculiarity of the side framing consists in the use of "herring-bone" ribs, or diagonal braces, between the posts. These are tenoned $\frac{1}{16}$ of an inch into the posts, and glued, and are used only below the windows. This method is said to give greater stiffness to the side-walls. The Miller platform has been attached to 150

passenger cars during the present year, leaving only five cars not provided with it. Mr. W. B. Snow is the master car-builder of the road.

THE Chicago and Northwestern R. R., is building at its Chicago shops 20 caboose cars, and repairing a number of passenger train cars damaged in recent wrecks, besides keeping up its freight repairs. Three new passenger coaches are building at the Fond du Lac shops, of the standard road pattern, and will be equipped with the latest improvements.

THE shops of John Stephenson & Co., in New-York, have recently completed and shipped several cars for the St. Petersburg Tramway Company, of St. Petersburg, Russia. That company has also ordered several cars from English and Belgian makers, which are to be used in competition with the American cars, and the final contract for a large number will be given to the maker whose work proves most satisfactory. The cars are somewhat different from those in use in this country, being arranged for 22 seats inside, and the same number on the top. The length of the car is 26 feet. As no passengers will be allowed to stand, the cars, when loaded, can be drawn by two horses. The roofs are curved, and the seats on the top are reached by stairways at each end of the car. The empty cars weigh about 4650 pounds, and cost, at schedule prices, $1125 each.

THE machine shops of the Marietta and Cincinnati Railroad, at Chillicothe, Ohio, have a furnace for making blooms, and also a 30-ton steam hammer, for forging iron. The furnace occupies a small space in a corner of the blacksmith shop; it can be heated in forty minutes, and has a capacity of six tons per day. With these appliances are made and finished all the axles used on the road; blooms are also made for merchant bar-iron, bridge-rods, etc., and sent to Cincinnati to be rolled, reducing the cost to one half by thus utilizing the road scrap. Mr. E. M. Bosley is the master-mechanic.

IN the passenger car department of the Toledo, Wabash and Western shops, at Toledo, 11 coaches and 3 Pullman cars are undergoing repairs, and one Sanderson sleeper is being changed into a day coach. The condition of the car equipment is always accurately known by a record or system of accounts, showing the character and service of each car, date and nature of repairs, and other particulars, so that every car is called into the shops for ordinary or general repairs after the lapse of a certain specified time. As a rule, passenger cars are revarnished once in ten months; and if this is done, it is calculated that the paint will last from six to eight years. The road has 63 ordinary coaches, 6 Pullman, and 43 baggage and mail cars; 61 of these have been revarnished during the present year, and some of them repainted. Ten cars are constantly in the shops for this purpose. The road has about 5000 freight cars, of which 1000 or 1200 are repainted every year. The standard M. C. B. axle is used for all new work. The shops are under the supervision of Mr. U. H. Kohler, the master car-builder of the road. The shops of the road at Fort Wayne, are under the direction of Mr. J. B. Morse, the master mechanic, who has just completed a punching machine which is claimed to be superior to any other machine of the kind in the country.

MR. J. TOWNSEND, the master car-builder of the Missouri, Kansas and Texas R.R., was presented with an elegant gold watch by the employees of the car department, at Sedalia, on the occasion of his retirement from that position.

WE call attention to the advertisement, in another column, of the Loughridge Air-Brake. This brake is not a new and untried invention, but one that has been proved on the Baltimore and Ohio Railroad and other roads, to be a complete success, and is now in constant use on 2500 miles of railroad.

A Lesson for Brakemen.

A RAILROAD brakeman who had been celebrating his grandfather's birth-day, was arraigned before a Detroit police court. "You run on the cars, eh?" asked the Court. "Yes, sir." "And you belong to that class of men who open the door as the train stops at Pontiac, and yell out 'Upontyack!' at the passengers. The man was silent. "It makes my bones boil to think how I've been used on these railroads," continued his Honor. "The seats are locked, the water-cooler empty, the windows won't stay up, and every few minutes you open the door and cry out 'Jawkun' for Jackson, or 'Kl-a-zoo' for Kalamazoo. I believe I'll mark you for six months." "Please, sir—" protested the prisoner. "I must strike a blow at this great evil somewhere, and I might as well commence on you." "Please, sir, I was never here before, and it's my first drunk in four years." His Honor leaned back and chewed the corner of a blotting-pad while he reflected. Finally he said: "Well, I'll let you go, though I'll be blamed for it. Now, sir, after this you want to adopt a different style. When the train approaches a station, you want to go through the car like a cat, smile gently, and say in quiet tones, 'Ladies and gentlemen, this train is now in the outskirts of the beautiful city of Ypsilanti, and such of you as desire to step off will please make ready; and may health and prosperity ever attend you.' What an innovation that would be, sir! How the traveling public would rush for your road! Will you do this, Mr. Wellington?" The prisoner promised, and was allowed to go.

The Cabinet Maker.—This old and reliable organ of the furniture trade comes to us in a new dress, more convenient for readers as well as for binding and preservation. It is one of the most successful trade journals in the country, and has won its enviable reputation by a strict adherence to its special field of labor, developing all its capacities, and furnishing to manufacturers, dealers, employers, and employees, a weekly summary of information indispensable to their several interests, as well as to the general interests of the trade. Nor has its usefulness been confined to these limits. Its articles, both original and selected, have possessed an interest for the general reader, and have done much to improve public taste, where it so much needed improvement, in the departments of design and ornamentation, and with respect to the manifold relations and adaptations of form, color, material, texture and quality, of whatever pertains to the interior decoration and comfort of our dwellings. The paper in its new stitched quarto form, with tinted cover, contains four full page illustrations, full market reports, trade news, and an index to its numerous advertisements. J. Henry Symonds, editor and publisher, 68 Devonshire street, Boston. Published weekly at $2.50 per annum.

MECHANICS' straight edges and squares are not so apt to warp when made from old saw blades, as when they are manufactured from rolled iron or steel that has not been used since being rolled.

IRON may be cemented in wood by dropping in the recess prepared in the latter, a small quantity of a strong solution of sal ammoniac. This causes the iron to rust, rendering it very difficult to extract.

THERE is a proposition on foot in Parkersburg, W. Va., looking to the erection there by the Baltimore and Ohio Railroad Company of extensive shops.

THE Kansas Central and Black-hills narrow gauge railroad company, with a capital of $100,000, has been organized in Omaha. The road will be built at once from there through the agricultural country south of the Platte river, and will be pushed toward the Black-hills as soon as the development of that region warrants. So says an Omaha telegram.

THE San Francisco *Mining Press* says that the iron foundries and machine shops of California are an exception to the general depression of the iron trade of the world, and are all very busy, with well-founded prospects for at least a year or two more of the future.

Locomotive Track-Broom.

MESSRS. M. C. Isaacs & Co., proprietors of the Phenix Steel-Wire Broom and Brush Works, of Chicago, are supplying railroads with a broom made of steel wire, to be attached to locomotives forward of the truck wheels for the purpose of keeping the track clear of light snow and other obstructions. They are so arranged that they can be lifted clear of the rails when their use is not required. They have been tried on many roads, and are found to be both durable and serviceable. We refer to advertisement on p. iii.

Facetiæ.

A WIFE who had been lecturing her husband for coming home intoxicated, became incensed at his indifference, and exclaimed: "Oh! that I could wring tears of anguish from your eyes!" To which the hardened wretch hiccoughed: Tai-'taint no use, old woman, to bo-bore for water here."

"THUNDER!" exclaimed a man, rushing into a railroad telegraph station the other day. "The express train's gone off the big bridge!" "Many killed, many killed?" screamed the by-standers. "Not a one," replied the other. "She just went on at one end and went off at the other, just as usual."

AN injudicious burglar worked five hours one night last week, burrowing into one of the railroad buildings at Chester, and after he effected an entrance, exhausted, perspiring and profane, he had his choice of stealing a hand car or a disabled freight car truck. Long, long hours after he had passed out of sight down the railroad track, the people of Chester could hear him swear.

IT was at a party that some young ladies were discussing the relative benefits of the sparrows and the worms, when one of the fair ones appealed to young Fizzleton, who had just joined them, and had not caught the drift of the conversation, "Which do you think the worst, worms or sparrows?" What did the stupid brute do but innocently answer, "I don't know; I never had sparrows."

A YOUNGSTER being required to write a composition upon some portion of the human body, selected that which unites the head to the body, and expounded as follows: "A throat is convenient to have, especially to roosters and ministers. The former eats corn and crows with it; the latter preaches through his'n, and then ties it up. This is pretty much all I can think of about necks."

A MAN in North Carolina who was saved from a conviction for horse stealing by the powerful plea of his lawyer, after his acquittal by the jury, was asked by the lawyer: "Honor bright, now, Bill, you did steal that horse, didn't you?" "Now look a-here, judge," was the reply, "I allers did think I stole that hoss, but since I hearn your speech to that 'ere jury, I'll be dogoned if I aint got my doubts about it."

HE was level full, and as he boarded a South Boston car, he remarked: "Whazzer name that c'ductor tother car?" pointing vaguely at a departing vehicle. "Don't know," was the reply. "Well, he told me go takernap, aintergoint do it. I'm juss wideawakes he or any otherman, and I don't want himmer nobody else tell me gotakernap 'n don't you fergizzit." He elucidated the subject for some time to the passengers and finally stepped off to hunt up that other conductor.

NEEDHAM'S
Safety Signal Light,
FOR
PREVENTING REAR COLLISIONS.

Shows in both directions whether the train is moving fast, or slow, or stopped.

In cases of trains uncoupling it is superior to the *"Block System,"* and for safety to trains following, it is the *Best Light in Use,* indicating by the simplest mechanism, both speed and distance.

CARS EQUIPPED FOR TRIAL FREE.

ADDRESS,

WM. L. NEEDHAM,

No. 81 Hicks St., W. S.,

CLEVELAND, O.

W. LOUGHRIDGE AIR-BRAKE,

Adopted and in daily use on all the passenger rolling stock of the Baltimore and Ohio, Connellsville and Pittsburg, Marietta and Cincinnati, Sandusky and Newark, Central Ohio, W. P. and S., Orange and Alexandria, Western Maryland, Cumberland and Pennsylvania (with 182 feet of zigzag grades to the mile), and others. The cheapest in equipment and repair, and the most effective brake in the world for general purposes. Better results guaranteed in every-day use than were accomplished in the recent great competitive trial of brakes in England.

I challenge all owners of competing brakes to meet me on public trial, at the great Centennial, in 1876. Rights low, as I am sole owner of my patents.

Refer to any one of the executive officers, master-mechanics, conductors, or engineers on the above roads.

P. O. BOX 441, BALTIMORE, MD.



PORTABLE and STATIONARY
STEAM ENGINES, STEAM BOILERS.
SAW, FLOUR AND GRIST MILLS.
MILL GEARING MADE
Without Patterns.
SHAFTING, PULLEYS AND HANGERS
A Specialty.
POOLE & HUNT.
SEND FOR CIRCULARS. BALTIMORE, MD.

RICHARD DUDGEON,

No. 24 Columbia Street, New-York,



Maker and Patentee of

Hydraulic Jacks and Punches,

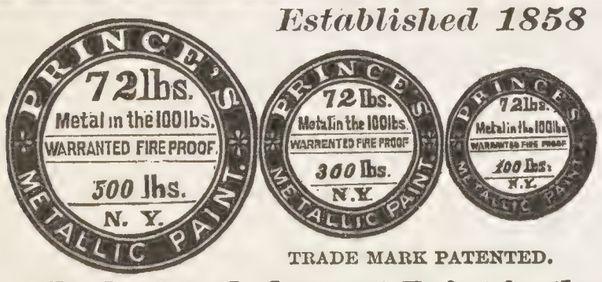
BOILER TUBE EXPANDERS,

AND DIRECT-ACTING STEAM HAMMERS.

Communications by letter will receive prompt attention.

Jacks for pressing on Car-Wheels or Crank Pins made to order.

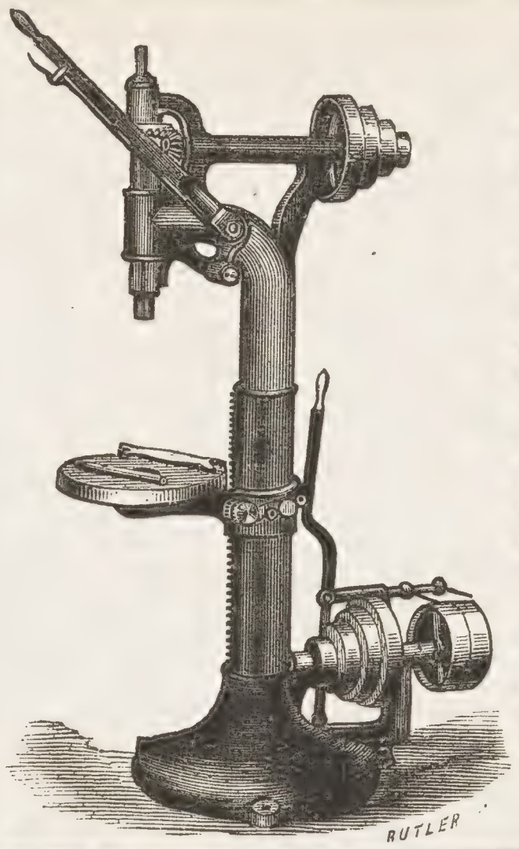
Established 1858



TRADE MARK PATENTED.

The best and cheapest Paint in the world for Iron, Tin or Wood. For sale by the Trade everywhere. PRINCE'S METALLIC PAINT CO., Manufacturers, 96 Cedar St., New York.

CAUTION.—Purchasers and consumers are cautioned against imitations of our METALLIC PAINT. All genuine *PRINCE'S METALLIC PAINT* will bear our name and trade mark on each and every package. Send for a circular.

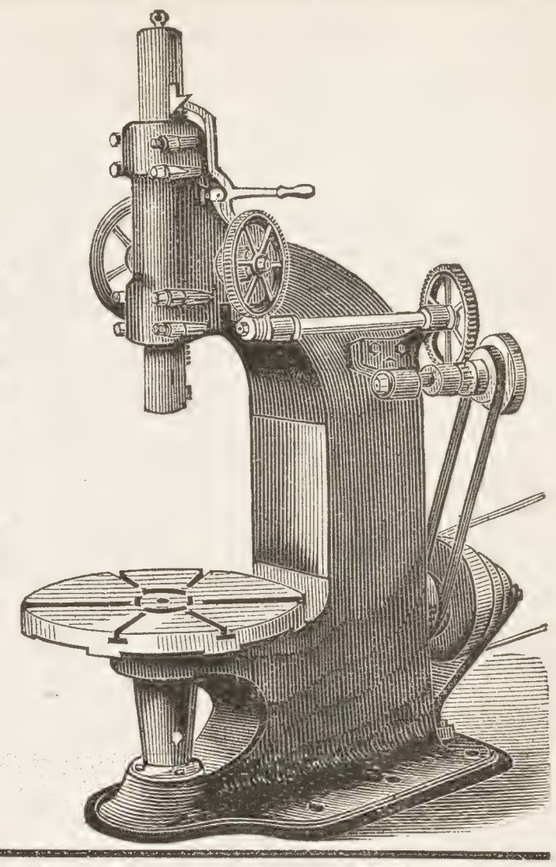


EDWIN HARRINGTON & SON,

Manufacturer of **ENGINE LATHES**, from twelve (12) to forty-eight (48) inches swing; **Hand Lathes; Wood Turning Lathes; Vertical Drills; Boring Mills; Tapping and Centring Machines; Screw Press** for Mandrels; **Grindstone Boxes.**

Cor. North-Fifteenth St. and Pennsylvania Ave.

PHILADELPHIA.



ROOFS

Improved Plastic Slate

will repair and preserve old roofs of shingles, tin, cement, or of any kind, cheaper and more substantially than any thing else in use. It has been tested and improved upon for ten years, and is a perfect protection against *weather* and *fire*, and is indorsed by EIGHTY-TWO FIRE INSURANCE COMPANIES. Reference is made to over 2000 ROOFS in New-York—on CHURCHES, BROWN STONE DWELLINGS, FACTORIES, etc. It is equally good for *steep* or *flat* roofs, and is easily applied on old or new buildings.

PRICES OF MATERIALS READY FOR USE.

For an entirely new roof, 5 cents per square foot. Old shingle roofs can be coated and made tight and fire-proof for 1½ cents per square foot. Tin roofs for ½ cent per square foot. Gravel roofs for 1½ cents per square foot. Felt and cement roofs for 1 cent per square foot.

Plastic Slate Paint, 60 cents per gallon.

Plastic Slate Roof Coating, thick, 60 cents per gallon.
Plastic Slate Cement, for pointing up chimneys, etc., 10 cents per pound.
One, two, and three ply Roofing Felt and Building Paper, 1, 2, and 3 cents per square foot.
Materials put up for shipment to any point, with simple instructions for use.
Country merchants should sell these Improved Plastic Slate Roofing Materials, as they can recommend them with entire confidence

EDWARD VAN ORDEN & CO., Sole Manufacturers,

Established 1863. **79 MAIDEN LANE, NEW-YORK.**

CAST-STEEL TIRES.

The high price demanded by Messrs. Thomas Firth & Sons, for their Steel Blooms, has compelled us, in order to meet the declining price of the manufactured Tire, to abandon our connection with that house, and to resort to the production of Steel Blooms for Tires at our own works; and after a large outlay for machinery of the most modern construction, in addition to that heretofore used by us in the manufacture of the "Firth" Tires, we are enabled to offer to our customers a most perfect article, which we guarantee fully equal to the "KRUPP" or "FIRTH" brands.

NASHUA IRON & STEEL CO. TRADE MARK NASHUA, N.H.

We are also in a position to fill orders with even greater dispatch than heretofore, being no longer obliged to depend upon foreign makers for any part of our stock, the importation of which has been the occasion of frequent delays.

The present price is 10 *cents per pound, currency.*

We also manufacture the following articles, equal to the very best produced, which we offer with every confidence of giving satisfaction, viz.:

Iron Forgings of all kinds; special quality of Bar Iron; Steel Car and Engine Axles; Homogeneous Steel Fire-Box and Boiler Plates; Steel Crank Pins and Lathe Spindles; Steel Piston Rods and Slide Bars; Steel Shafts, up to four tons weight; Special Steel Shapes and Forgings of all kinds.

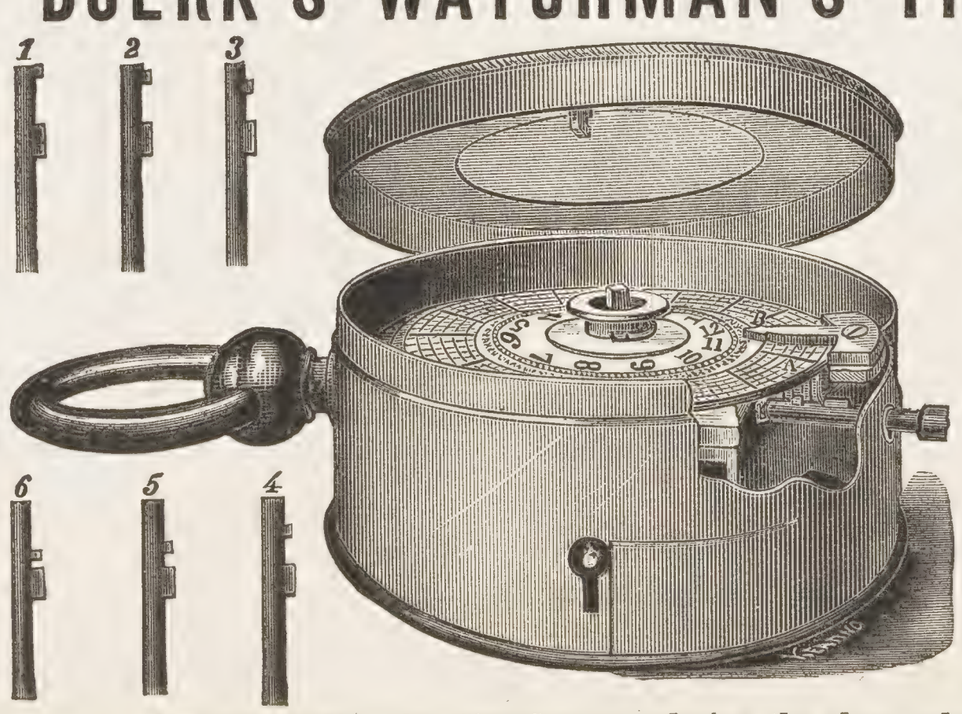
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N. B.—The public are notified that in my suit against *Imhaeuser & Co.*, of New-York, a decree was made in my favor, June 10, 1874.

Proceedings have been commenced against said *Imhaeuser & Co.* for selling clocks contrary to the order of the Court, and especially the clock with a series of springs in the cover and marked, "Patented October 20, 1874."

All persons discovered using these infringing clocks will be dealt with according to law.

☞ ***In sending for Circular or ordering the above, please mention this paper.*** ☜

Car Manufacturers.

Allison, W. C. & Sons	Philadelphia Pa.
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Altoona Manufacturing Co	Altoona, Pa.
Adrian Car Co	Adrian, Mich.
Arlington Car Manufacturing Co.	Arlington, Vt.
Barney & Smith Manufacturing Co	Dayton, Ohio.
Baker, Jackson & Co	Latrobe, Pa.
Bellefonte Car Manufacturing Co.	Bellefonte, Pa.
Billmeyer & Smalls	York, Pa.
Bradley, Osgood	Worcester, Mass.
Bridgeport Car-Works	Bridgeport, Pa.
Brill, J. G. & Co	Philadelphia, Pa.
Buffalo Car Co	Buffalo, N. Y.
Canada Car Co	Toronto, Canada.
Canda, F. E. & Co	Chicago, Ill.
Cape Fear Building Co	Abbottsburg, N. C.
Cartersville Car Co	Cartersville, Ga.
Central Car & Manufacturing Co	Jackson, Mich.
Clendenning, W. W	Montreal.
Cummings Car-Works	Jersey City, N. J.
Connellsville Machine and Car Co	Connellsville, Pa.
De Pere Iron-Works	De Pere, Wis.
Detroit Car-Works	Detroit, Mich.
Dawson Manufacturing Co	Dawson, Ga.
Dickey, Neill & Co	Toronto.
Dickson Manufacturing Co	Scranton, Pa.
Erie Car-Works	Erie, Pa.
Elmira Car-Works	Elmira, N. Y.
Frederick & Co	Catasauqua, Pa
Freas Brothers & Thornton	Berwick, Pa.
Gardner, F. & Co.	Carlisle, Pa.
Gill, John L	Columbus, Ohio.
Gilbert, Bush & Co	Troy, N. Y.
Goold, James & Co	Albany, N. Y.
Goodrich Car Co	Augusta, Ga.
Hannibal Car Works	Hannibal, Mo.
Harris, J. & Co	St. John, N. B.
Harrisburg Car Manufacturing Co	Harrisburg, Pa.
Haskell & Barker Car Co	Michigan City, Ind.
Heathcote, Herbst & Co	Glen Rock, Pa.
Hamilton, William & Son	Toronto.
Harlan & Hollingsworth Co	Wilmington, Del
Herrick Car-Works	Oswego, N. Y.
Huntingdon Car-Works	Huntingdon, Pa.
Indiana Car Co	Cambridge City, Ind.
Jackson & Sharp Co	Wilmington, Del.
Jackson & Woodin Manufacturing Co	Berwick, Pa.
Jones, J. M. & Co	West-Troy, N. Y.
Kimball Manufacturing Co	San Francisco, Cal.
Keith, H. T. & I. N	W. Sandwich, Mass.
Laporte Car Manufacturing Co	Laporte, Ind.
Lombard, Thomas	Augusta, Me.
Lebanon Manufacturing Co	Lebanon, Pa.
Lehigh Car Manufacturing Co	Stemton, Pa.
Litchfield Car Manufacturing Co	Litchfield, Ill.
Mansfield Machine-Works	Mansfield, Ohio.
Michigan Car Co	Detroit, Mich.
McNairy, Claflen & Co	Cleveland, Ohio.
Murray, Dougall & Co	Milton, Pa.
McVay, Walker & Co	Braddock's Field, Pa.
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Middletown Car & Manufacturing Co	Middletown, Pa.
Missouri Car and Foundry Co	St. Louis, Mo.
Myers, H. S. & Co. (small cars)	York, Pa.
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New-Haven Car Co	New-Haven, Ct.
Niblo, James M	Conshohocken, Pa.
Ohio Falls Car Co	Jeffersonville, Ind
Ontario Car Co	London, Ont.
Oxford Co-operative Car Co	Oxford, Pa.
Patten Car-Works	Bath, Maine.
Peabody & Crangle Bro's	Calais, Me.
Peters, Simon	Quebec.
Petersburg Car Co	Petersburg, Va.
Pittsburg Car-Works	Pittsburg, Pa.
Pittsburg and McKeesport Car Co	McKeesport, Pa.
Pittsburg Car and Locomotive Co	Pittsburg, Pa.
Portland Co	Portland, Me.
Pullman Car Co	Chicago and Detroit.
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Schall, Michael	York, Pa.
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Shaaber & Johnston	Reading, Pa.
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Stephenson, John & Co	New-York, N. Y.
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Taunton Car Co	Taunton, Mass
Terre Haute Car & Manufacturing Co	Terre Haute, Ind.
Tredegar Co	Richmond. Va.
Watsontown Car Co	Watsontown, Pa.
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Wason Manufacturing Co	Springfield, Mass
Weimer, P. L. & Bros	Lebanon, Pa.
Wight, Andrew (street cars)	St. Louis, Mo.
Wyoming Valley Manufacturing Co	Wilkesbarre, Pa.
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Atlantic Iron-Works	Portsmouth, Va.
Baltimore Car-Wheel Foundry Co	Baltimore, Md.
Barnum Richardson Manufacturing Co	Chicago, Ill.
Barnum Richardson Co	Lime Rock, Conn.
Barney & Smith Manufacturing Co.	Dayton, Ohio.
Bass & Hanna	Fort Wayne, Ind.
Blanchard & Arnold	Milwaukee, Wis.
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Bowler, Mayer & Brayton	Cleveland, Ohio.
Cayuta Wheel & Foundry Co.,	Waverly, N. Y.
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Harrisburg Car Manufacturing Co	Harrisburg, Pa.
Haskell & Barker Car Co	Michigan City, Ind.
Heartt, Jonas S. & Co	Troy, N. Y.
Jackson & Woodin	Berwick, Pa.
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Litchfield Car M'f'g Co	Litchfield, Ill.
Lobdell Car-Wheel Works	Wilmington, Del.
London Car-Wheel Co	London, Can.
Louisville Car-Wheel & Railway Supply Co	Louisville, Ky.
Middlebrook & Mack	Oswego, N. Y.
Missouri Car and Foundry Co	St. Louis, Mo.
Mowry Car and Wheel Works	Cincinnati, Ohio.
Nash, John & Co	Cincinnati, Ohio.
Ohio Falls Car Co	Jeffersonville, Ind.
Parker & Bailey	St. Paul, Minn.
Pettengill, Glass & Co	Cleveland, Ohio.
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Hinckley Locomotive Works	Boston, Mass.
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McKay Iron and Locomotive Works	Jersey City, N J.
Portland Company	Portland, Me.
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Pittsburg Locomotive Works	Pittsburg, Pa.
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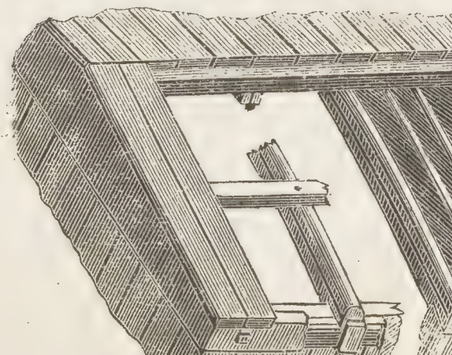
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Sacramento Division	M. W. Cooley		Rocklin, Cal.
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Salt Lake Division	W. H. McKenzie	G. J. Turner.	Ogden, Utah.
California Pacific Division	D. Rutherford	D. Rutherford	Vallejo, Cal.
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Detroit & Milwaukee	C. M. Hanson		Detroit, Mich.
Detroit, Lansing & Lake Michigan	Tho. E. Roberts		Ionia, Mich.
Delaware & Hudson Canal Co.	‖‖R. C. Blackall		Albany, N. Y.
Dorchester & Delaware			Cambridge, Md.
Dubuque South-Western	James Rollo	James Rollo	Farley, Iowa.
Dutchess & Columbia	W. G. Vanbuskirk	H. A. Webster	Fishkill, N. Y.
Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett.	Dunkirk, N. Y.
E			
Eastern		J. P. Somerby.	Salem, Mass.
Eastern	John Thompson		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L. Weaver	Riverton, Ky.
East-Tennesee, Virginia & Georgia	C. A. Hodge		Knoxville, Tenn.
Erie Railway	§§Frank K. Hain		Susquehanna, Pa.
Erie Railway	Robert Wallace		Susquehanna, Pa.
Erie Railway	V. Blackburn		Jersey City, N. J.
Erie Railway	F. M. Wilder	M. Wilder	Buffalo, N. Y.
Erie Railway	J. W. Chapman	J. W. Chapman	Hornellsville, N. Y.
Erie Railway		‖D. B. Goodell	Elmira, NY.
Erie Railway		‖J. B. Hill	Jersey City N. J.
Erie Railway	J. Van Vechten	‖J. Van Vechten	Port Jervis, N. Y.
Erie Railway	A. T. Back		Rochester, N. Y.
Erie & Pittsburg	G. J. Parkin.	G. J. Parkin.	Erie, Pa.
European & North Am. (of Maine)	A. O. Bailey	J. H. Brown	Oldtown, Maine.
Evansville & Crawfordsville	John L. White	Joseph Stiker	Evansville, Ind.
Evansville, Terre Haute & Chicago	§§Beriah Warren		Terre Haute, Ind.
F			
Fitchburg	Geo. A. Cooledge	Enos Varney	Charlestown, Mass.
Vermont & Mass. Div.	W. A. Foster	Jacob Marsh	Fitchburg, Mass.
Fitchburg & Worcester	John Webster	Samuel Stevens	Fitchburg, Mass.
Flint & Pere Marquette	Sanford Keeler	‖R. B. More	East-Saginaw, Mich.
Florida	Ezra Gray	G. Hernandez	Fernandina, Fla.
Flushing & North Shore	Wm. La Suer	C. Wilkinson	Hunter's Point, L. I.
Fort Wayne, Jackson & Saginaw		Lewis Colburn	Jackson, Mich.
G			
Galveston, Harrisburg & San Antonio	S. W. Tozer.		Harrisburg, Texas.
Galveston, Houston & Henderson	Jno. G. Coulon	Jno. G. Coulon	Galveston, Texas.
Georgia	William Hardman	T. M. Preval,	Augusta, Ga.
Gilman, Clinton & Springfield	W. B. McKenna		Clinton, Ill.
Grand Tower & Carbondale	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk		Warren Noyes	Gorham, Me.
Grand Trunk	†Herbert Wallis	Wm. McWood	Montreal, Canada.
Grand Trunk			Sherbrooke, Can.
Grand Trunk		B. J. Mitchell	Portland, Me.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne, Ind.
Great Western of Canada	†John Ortton	F. Childs	Hamilton, Canada.
Green Bay & Lake Pepin	J. H. Erwin		Green Bay, Wis.
Greenville & Columbia	R. H. Anderson	R. H. Anderson	Helena, S. C.
H			
Hackensack & New-York	Abra'm Angausen		Hackensack, N. J.
Hanover Branch	John J. Bingley	Henry Britcher	Hanover, Pa.
Hannibal & St. Joseph	**Jno. MacKenzie	J. Townsend	Hannibal, Mo.
Hartford, Providence & Fishkill	Edwin Garfield	V. D. Perry	Hartford, Ct.
Housatonic	C. R. Morris.	J. J. Ferris	Falls Village, Ct.
Houston & Texas Central	L. C. Noble	James McGee	Houston, Texas.
Huntington & Broad-Top Mountain	W. W. Coller	M. Tellerhoof	Saxton, Pa.
I			
Illinois Central	**S. J. Hayes	W. B. Snow	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia, Ill.
North Division	J. B. Edams		Amboy, Ill.
Iowa Division	Thomas W. Place		Waterloo, Iowa.
Illinois Midland	J. G. Clifford	G. Clifford	Paris, Ill.
Illinois & St. Louis.	James Hazen		Bellville, Ill.
Indianapolis, Cincinnati & Lafayette	J. S. Patterson	S. Griffith	Cincinnati, Ohio.
Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Indianapolis & St. Louis	A. J. Sanborn		Mattoon, Ill.
Indianapolis, Bloomington & Western	**H. L. Cooper	A. J. Allen	Urbana, Ill.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ia.
International & Great Northern	R. B. Small		Palestine, Texas.
Intercolonial	Wm. Whitney	Edw. Shaffer	Moncton, N. B.
Iron	Perry Scott	Clem. Roetling	Ironton, Ohio.
Ithaca & Athens	F. A. Brown		Ithaca, N. Y.
J			
Jacksonville, Pensacola & Mobile	H. D. Kennedy		Jacksonville, Fla.
Jeffersonville, Madison & Indiana	Reuben Wells.		Jeffersonville, Ind.
Junction & Breakwater	J. A. Maguire.		Lewes, Del.
K			
Kalamazoo, Allegan & Grand Rapids			Kalamazoo, Mich.
Kansas City, St. Joseph & Council Bluff	Wm. D. Rowley	Wm. D. Rowley	St. Joseph, Mo.
Kansas Central	John Davis		Leavenworth, Kan.
Kansas Pacific	**L. H. Waugh	H. M. Roberts	Wyandotte, Kansas.
Denver Pacific Div	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div.	**L. H. Waugh		Wyandotte, Kansas.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Junction City & Ft. Kearney Div	**L. H. Waugh.		Wyandotte, Kansas.
Arkansas Valley Div	**L. H. Waugh		Wyandotte, Kansas.
Kentucky Central	J. R. Ledyard	J. L. Hackathorn.	Covington, Ky.
Keokuk & Des Moines Valley	S. W. Wakefield	M. Sessions	Keokuk, Iowa.
King's Mountain	E. Thomas	E. Thomas	Chester, S. C.
Knox & Lincoln	§§E. R. [illegible]mlin	Benj. Soule	Bath, Me.
Knoxville & Charleston			Knoxville, Tenn.
L			
Lackawanna & Bloomsburg	Chas. Graham	Chas. Graham	Kingston, Pa.
Lake Erie & Louisville	John Pero		Fremont, Ohio.
Lake Ontario Shore	Wm. Harris		Oswego, N. Y.
Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland, Ohio
Michigan Southern Division	Geo. W. Stevens		Elkhart, Ind.
" " "		S. S. Knapp.	Adrian, Mich.
Toledo Division	J. M. Sanborn.	Frank O. Bray	Norwalk, Ohio.
Erie Division	L. O. Gassett.	J. Withyecombe.	Cleveland Ohio.
Buffalo Division	W. L. Wallace	A. C. Robson	Buffalo, N. Y.
Lake Superior & Mississippi	S. W. Leslie	John Hill	St. Paul, Minn.
Lehigh Valley	John I. Kinsey		South-Easton, Pa.
Lehigh Valley	P. Hofecker	E. R. Brown	Weatherly, Pa.
Lehigh Valley	John Campbell	Mauch Chunk, Pa.	Delano, Pa.
Lehigh Valley	D. Clark		Hazleton, Pa.
Leavenworth, Lawrence & Gal	J. S. McCrum		Lawrence, Kansas
Little Rock & Fort Smith	James Eblin	D. R. Wing	Argenta, Ark.
London & Port Stanley			London, C. W.
Louisville, New-Albany & Chicago	Geo. Ruhlandt	Geo. Helfrich	New-Albany, Ind.
Long Island	Chs. A. Thompson	C. A. Thompson	Hunter's Point, L.I.
Louisville, Cincinnati & Lexington	S. S. Pilson	S. S. Pilson	Louisville Ky.
Louisville & Nashville	†Thatcher Perkins	Isaac M. Owens	Louisville, Ky.
Louisville Division	D. P. Rennie		Louisville, Ky.
Clarksville Division	Jas. Montgomery		Bowling Green, Ky.
Nashville & Decatur Division	W. J. Steele		Nashville, Tenn.
South & North Ala. Div.	C. E. Slade	W. L. Gude	Birmingham, Ala.
Memphis & Ohio Div.	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Louisville, Paducah & So. Western	W. D. Robb	Frank Looney.	Elizabethtown, Ky
M			
Macon & Augusta			Macon, Ga.
Macon & Brunswick	R. Wagnon	R. Wagnon	Macon, Ga.
Macon & Western	D. M. Gogel	James A. Knight.	Macon, Ga
Maine Central	J. W. Philbrick	J. W. Philbrick	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div	John Ellis	C. H. Kenison	Augusta, Me.
Maine Central Division	John F. Merrill.		Waterville Me.
Manchester & Lawrence	Chas. L. Eastman.	M. W. Dickerman.	Concord, N. H.
Marietta, Pittsburg & Cleveland	W. J. Adams		Marietta, Ohio.
Marietta & Cincinnati	E. M. Bosley	E. M. Bosley	Chillicothe, Ohio.
Marquette, Houghton & Ontonagon	C. J. Shellhorn	H. D. Lyons	Marquette, Mich.
Maryland & Delaware	Samuel Peters		Greensboro, Md.
Memphis & Little Rock	Tho. Rennell	P. Twitchell.	Argenta, Ark.
Memphis & Charleston	A. Ross	A. W. Drew	Memphis, Tenn.
Memphis & Charleston	H. N. Burford	Fabien Varin	Huntsville, Ala.
Mineral Point	Robert Hay	Robert Hay	Mineral Point, Wis.
Mineral Range	Geo. F. Coon		Hancock, Mich.
Mississippi & Tennessee	Geo. Haszinger	J. Riny	Memphis, Tenn.
Michigan Central	§§Geo. S. Chalender.	Geo. S. Chalender	Jackson, Mich.
Michigan Central		‖Henry Whiting	Detroit, Mich.
Midland Pacific	A. C. Stiles		Lincoln, Neb.
Mississippi Valley & Western	J. S. Pickering		Canton, Mo.
Missouri, Iowa & Nebraska	J. G. Crozier		Alexandria, Mo.
Missouri, Kansas & Texas	Wm. Small		Parsons, Kan.
Missouri, Kansas & Texas	§§G. W. Cushing	John C. Barber	Sedalia, Mo.
Missouri, Kansas & Texas	J. E. Wiggins		Hannibal, Mo.
Missouri River, Fort Scott & Gulf	John S. McCrum	Alex. Montier	Kansas City, Mo
Mobile & Montgomery	James McFarland.	L. Barham	Montgomery, Ala.
Mobile & Girard	C D. Wall		Girard. Ala.
Mobile & Ohio		John McHugh.	Mobile, Ala.
Mobile & Ohio	R. McDougal	I. T. Booth	Whistler, Ala.
Mobile & Ohio	B. S. Herring		Macon, Miss.
Mobile & Ohio	R. H. Briggs		Jackson, Tenn.
Montgomery & Eufaula	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Algiers, La.
Montreal Northern Colonization	§§C. G. C. Simpson		Montreal, Can.
N			
Nashville & Chattanooga	John U. Eastman.	J G. Sawyer	Nashville, Tenn.
Naugatuck	Henry Hanford	George W. Gray.	Bridgeport, Ct.
New-Bedford	G W. Reynolds	John L. Gibbs	New-Bedford, Mass.
New-Brunswick	P. Logan	C. M. Kinnon	Fredericton, N. B.
New-Brunswick & Canada	Tho. Armstrong	G. Houlton	St. Andrew's, N. B
New-Haven & Northampton	Henry Fox.	Henry Fox.	New-Haven, Ct.
New-Jersey Midland	Duane Searle		Wortendyke, N.J.
New-Jersey & New-York	A. J. Auryansen		Jersey City, N. J.
New-Jersey Southern	Rufus Blodgett.		Manchester, N. J.
New-Orleans, St. Louis & Chicago		‡‡—— Allen	McComb City, Miss.
New-Orleans, St. Louis & Chicago	§§L. H. Sellars.		Water Valley, Miss.
New-Orleans, St. Louis & Chicago		G. H. White	McComb City, Miss.
New-Orleans & Mobile	§Josiah Bettis	W. J. Henderson.	Mobile, Ala.
New-York, Kingston & Syracuse	A. Q. Mackenbush.	G. Dikeman	Syracuse, N. Y.
New-York & Harlem	Wm. M. Strong	C. E. Garey	New-York.
New-York Central & Hudson River		††Leander Garey.	New-York.
New-York Central Division	‡G. B. Van Vorst	D. Hoit	West-Albany, N. Y.
New-York Central Division	Henry Watkeys.		Syracuse, N. Y.
New-York Central Division	Amos Gould	James Leary.	Rochester, N. Y.
New-York Central Division	Jas. Butman	Wm. Johnson	Buffalo, N. Y.
New-York Central Division	S. L. White	George Rowe	Niagara Falls, N. Y.
Hudson River Division	‡Wm. Buchanan.	E. A. Olmstead.	New-York City.
Hudson River Division	R. Greenalch	J. J. Conaghty	E. Albany, N. Y.
New-York, Boston & Montreal	W. G. Van Buskirk	H. A. Webster	Dutchess Junc., N Y.
New-York & Oswego Midland	§§W. A. Dripps		Oswego, N. Y.
Eastern Division	J. Minchell		Middletown, N. Y.
Middle Division	Tho. Howard		Norwich, N. Y.
Northern Division	Edward Van Vleck.	T. D. Day	Oswego, N. Y.
New-York & New-England	Geo. E. Boyden	Elias E. Pratt	Boston, Mass.
New-York, Providence & Boston	Jas. H. Anderson.	Jas. H. Anderson.	Providence, R. I.
New-York, New-Haven & Hartford	§§H. Kittendorf	James Denver	New-Haven, Ct.
New-York, New-Haven & Hartford	E. S. Brewer	F. Leppens.	Hartford, Ct.
Northern Central	G. W. Rhodes		Baltimore, Md.
Northern Central	James Strode	G. W. Demarest.	York, Pa.
Northern New-Hampshire	James W. Lander.	Albert Langmaid.	Concord, N. H.
Northern of Canada	P. Clark.	P. Clark	Toronto, Can.
Northern Pacific	**H. A. Towne		Brainerd, Minn.
Minnesota Division	W. H. Lewis		Brainerd, Minn.
Dakota Division	C. W. Rossiter		Fargo, D. T.
Pacific Division	J. F. Curtis		Kalama, W. T.
North-Carolina	Rufus D. Wade	B. G. Sergeant	Co. Shops, N. C.
North-Louisiana & Texas	C. H. Tull		Monroe, La.
North-Pennsylvania	Franklin Roop	Franklin Roop	Philadelphia, Pa.
North-Eastern	D. W. Haines	A. M. Corrie	Florence, S. C.
Norwich & Worcester	Richard Colburn	G. R. Bentley	Norwich, Ct.
O			
Ohio & Mississippi		G. Hibbert	Cochran, Ind.
Ohio & Mississippi	‡J. D. W. Potts		Seymour, Ind.
Oil City & Pithole	George Thompson		Pithole, Pa.
Oil Creek & Alleghany River	H. J. Bookhammer.	John Monks	Oil City, Pa.
Old Colony & Newport	J. K. Taylor	A. Gleason	Boston, Mass.
Oregon & California	§§J. Brandt.		Portland, Oregon.
Owensburg & Russellville	J. R. Osborne		Owensburg, Ky.
P			
Paducah & Memphis	J. S. Mackay		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Panama	Chas. E. Stewart		Aspinwall, N. G.
Pacific of Missouri	§§John Hewitt	J. Hodge	St Louis, Mo.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Pennsylvania	§§T. N. Ely		Altoona, Pa.
Pennsylvania	H D. Garrett	I. W. Van Houten.	W. Philadelphia, Pa.
Pennsylvania	E. L Caum	Samuel W. Myers	Harrisburg, Pa
Pennsylvania	G W. Strattan	John P. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver.	R. S. Ramsey	Pittsburg, Pa.
New-Jersey Division	L. A. Bosdevex		Meadow Shops, N. J.
New-Jersey Division		David H. Baker.	Jersey City, N. J.
West-Penn. Division	C. B. Street	M. H. Fales	Blairsville, Pa.
Peoria & Rock Island	Geo. Gregg		Peoria, Ill.
Peoria, Pekin & Jacksonville	R F. Hurd	R. F. Hurd.	Pekin, Ill.
Petersburg & Weldon	R. B. Andrews	Alex. Wright	Petersburg, Va.
Philadelphia, Wilmington & Baltimore	S. A. Hodgman.	Wm. Lundgren	Wilmington, Del
Philadelphia & Baltimore Central	S. D. Danfield.	Samuel D. Danfield.	Chester, Pa.
Philadelphia and Erie	Martin Walls		Sunbury, Pa.
	W. L Forster		Renovo, Pa
	W. L. Holman		Kane. Pa
	W. T. Smith.		Erie, Pa.
	§§Howard Fry		Erie, Pa.
Philadelphia & Reading	L. B. Paxson	Aaron Steinbach.	Reading, Pa.
Germantown & Norris'n Div.	Jackson Richards		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis		‖D. F. Andregg	Dennison, Ohio.
Pittsburg & Columbus Division	Ross Kells	Thos. D. Furgusen.	Steubenville, Ohio.
Little Miami Division		M. P. Ford	Columbus, Ohio
Little Miami Division	J. H. Setchel	John McVay	Cincinnati, Ohio.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlin	Columbus, Ohio.
Col., Cin. & Ind. Division	Geo. H. Prescott	Geo. H. Prescott	Logansport, Ind.
Pittsburg, Fort Wayne & Chicago	S. M. Cummings	John Marquis	Allegheny, Pa.
Pittsburg, Fort Wayne & Chicago	J. M Boon	Israel Lee	Fort Wayne, Ind
Pittsburg, Fort Wayne & Chicago		J. J. Kirkland	Crestline, Ohio.
Pittsburg, Virginia & Charlston	W. Lininger		Pittsburg, Pa.
Pittsburg, Washington & Baltimore	§Wm. Stearns		Connellsville, Pa.
Pittsburg, Washington & Baltimore	J. E. Sampsel	J. M. Leach	Pittsburg, Pa.
Portland & Rochester	John G. Brady	John G. Brady	Portland, Me.
Portland & Oxford Central	Geo. W. Battles	Geo. W Battles.	Buckfield, Me.
Portland, Saco & Portsmouth	John Donnell		Portland, Me.
Port Royal	Geo. Riley	J. H. Milton	Augusta, Ga.
Port Hope, Lindsay & Beaverton	H G Taylor	H. G Taylor	Port Hope, Can.
Portsmouth, Gt. Falls & Monmouth	James Tucker	E. Fall	Union Village, N.H.
Poughkeepsie & Eastern	John L Driscoll	Jerry Wigg	Poughkeepsie, N. Y.
Providence & Worcester	Joseph Kelly	Olney L Smith	Providence, R. I.
Providence, Warren & Bristol	Rufus Smith	J. Brightman	Bristol, R. I.
Q			
Quincy, Alton & St. Louis	J. O. Gravell	W. G. Gilbert	Quincy, Ill.
Quincy, Missouri & Pacific	W. F. Smith	W. F. Smith	Kirksville, Mo.
R			
Raleigh & Gaston	B. R. Harding	B. R. Harding	Raleigh, N. C.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Richmond, Fredericksburg & Potomac	H. Kuhn	W. H. Trainham	Richmond, Va.
Richmond, Danville & Piedmont		J. B. Vaughan	Richmond, Va.
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond, Va.
Richmond & York River	C. H. Harris	J. L. Thompson	Richmond, Va.
Rive De Loup	P. A Logan	C. R. McKinnin	Fredericton, N. B.
Rome, Watertown & Ogdensburg	Abram Klohs	H. H. Sessions	Rome, N. Y.
Rome, Georgia	O. W. Harbin	O. W. Harbin	Rome, Ga.
Rochester & Genesee Valley	M. E. Brown	M. Wilder	Buffalo, N. Y.
Rockford, Rock Island & St. Louis	Joseph Elder	T. F. Nolte	Beardstown, Ill.
S			
Saginaw Valley & St. Louis	W. S. Thompson		Saginaw, Mich.
San Antonio & Mexican Gulf	W. T. Bingham		Victoria, Texas.
Savannah & Charleston	P. J. Hutson	J. D. Murphy	Charleston, S. C.
Seaboard & Roanoke	§§M. M. Pendleton		Portsmouth, Va.
Selma & Gulf	Wm. T. Daughtrey.		Selma, Ala.
Selma, Rome & Dalton		W. W. Peirce	Selma, Ala.
Selma, Marion & Memphis	Dolphus Gay		Marion, Ala.
Sheboygan & Fond du Lac	John Hickey	John Hickey	Sheboygan, Wis
Sioux City & Pacific	C. H. Foster		Missouri Val., Iowa.
Southern Pacific of California	J. P. Wilson	F. N. Bellisle	San Francisco, Cal.
South-Carolina	W. B. Smith	John Reed	Charleston, S. C.
Southern Central	Chas. G. Brown	H. Mooney	Auburn, N. Y.
Southern, of Long Island	Mark Brear	C. Wilkinson	Brooklyn, N. Y.
Southern Minnesota	§§J. B. Henney		Hokah, Minn.
South-Western of Georgia	C. D. Wall		Columbus, Ga.
South-Western of Georgia	D. M. Gogel	James A. Knight.	Macon, Ga.
South Side of Long Island	A. P. Doane	A. P Doane	Williamsburg, L
Spartanburg & Union	J. N. Benner	Jacob Rice	Union C. H., S. C
Springfield, Athol & Northeastern	W. E. Granger		Springfield, Mass.
Stanstead, Shefford & Chambly	W. H. Smith		Waterloo, C. E.
Stockton & Ione		W. T. Hoyt	Stockton, Cal.
Stonington & Providence	J. H. Anderson.	J. H. Anderson	Providence, R. I
St. Croix & Penobscot	Edward Bolton	A G. Page	Milltown, Me.
St. Joseph & Denver City	E. Sleppy		St. Joseph, Mo.
St. Lawrence & Ottawa	Calvin Dame.	Calvin Dame	Prescott, Canada.
St. Louis, Iron Mountain & Southern	O. A. Haynes	Oscar Doolittle	Carondelet, Mo.
Arkansas Division	L. Finlay	L. Finlay	Little Rock, Ark.
St. Louis, Vandalia, T. Haute & Ind.	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Indianapolis Division	Wm. Riley		Terre Haute, Ind.
Vandalia Division	A. J. Sanborn.		Effingham, Ind.
St. Louis, Alton & Terre Haute	**Beriah Warren		St. Louis, Mo.
St. Louis, Salem & Little Rock	Thos. Everson		Steelville, Mo.
St. Louis & South-Eastern	‖‖L. B. Salisbury		Mt. Vernon, Ill.
Nashville Division	‖E. M. Hamstone		Edgefield, Tenn.
St. Paul & Pacific	J. C. Monroe	T. W. Heathcote	St. Paul, Minn.
St Paul & Sioux City	F C. Butterfield	J. W. Lydic	Shakopee, Minn.
St. Louis, Kansas City & Northern	W. H. Selby	C. S Buck	Moberly, Mo.
St. Louis, Lawrence & Western	J. A. Hagan.		Lawrence, Kan.
Sullivan & Erie			Tonawanda, Pa.
Syracuse, Binghamton & New-York	H H. Dawson	David Burling	Syracuse, N. Y.
Syracuse Northern	W. Garrison	L. W. Smith	Syracuse, N..
T			
Tennessee & Pacific	William McKeand.	William McKeand.	Nashville, Tenn.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	J. A. Hanglin		Marshall, Texas
Tioga	Peres Bonny	D. H. Stratton	Blossburg, Pa
Toledo, Peoria & Warsaw	W. O. Hewitt	R. M. Hemphill	Peoria, Ill.
Toledo, Wabash & Western	§J. B. Morse		Fort Wayne, Ind
Toledo, Wabash & Western	‖John C. Wills.		Lafayette, Ind.
Toledo, Wabash & Western	Jacob Johann		Springfield, Ill.
Toledo, Wabash & Western		U. H. Kohler	Toledo, Ohio.
Toronto, Grey & Bruce	Wm. Bowstead		Toronto, Can
Toronto & Nipissing	J. Haggus		Toronto, Canada.
Troy & Boston	Foster Church	R. V. Coon	Troy, N. Y.
U			
Union Pacific	§I. H. Congdon	‡‡Geo. E. Stevens	Omaha, Nebraska.
Eastern Division		‖A. M. Collett	Omaha, Neb.
Eastern Division		‖H. P. Makely	Grand Island, Neb.
Mountain Divison		‖Jno. E. Davis	Cheyenne, W. T.
Laramie Division		‖Floyd Heavaner	Laramie, W. T.
Western Division		‖C. A. Phipps	Evanston, U. T.
Utah Central	Thos. Pierpont	Thos. Pierpont	Salt Lake City.
Utica & Black River	John Bailey	David James	Utica, N. Y.
Utica, Chenango & Susquehanna	C. H. Brown		Utica, N. Y.
V			
Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.
Virginia & Truckee	Wm. Bowker		Carson, Nev.
W			
Wash. City, Va. Midland & Gr. Southern	Jas. E. Waddey	J. T. Nalls	Alexandria, Va.
Washington & Ohio	Edward Dunn	Joshua Harrison	Alexandria, Va
Welland	James Taylor	James Chase	St. Catharine, C. W.
Westchester & Philadelphia	John Moyer	N. Pawling	Philadelphia, Pa.
Western & Atlantic	John H. Flynn	Wm. Grambling	Atlanta, Ga.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Western Maryland	Wm. Lannan	J. H. Nussear	Union Bridge, Md.
Western North-Carolina	J. D. Hollister	J. D. Hollister	Salisbury, N. C.
Western of Alabama	John McVey	F. M. Wade	Montgomery, Ala.
Western R. R. N. C	M. W. Atkinson	M. W. Atkinson	Fayetteville, N. C.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
West-Feliciana	J. A. Tilton	Wm. McKelvey	Woodville, Miss.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
West-Wisconsin	Matt Ellis	J. C. Fischer	Hudson, Wis.
White Water Valley	A. W. Britton		Harrison, Ohio.
Wilmington, Columbia & Augusta	W. H. Turrintine		Wilmington, N. C.
Wilmington & Weldon	John Bissit	C. R. Clowe	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Winona & St. Peter	F. C. Ford	F. C. Ford	Winona, Minn.
Wisconsin Central	G. Campbell	J. L. Adams	Stevens' P't, Wis.
Worcester & Nashua	Albert Griggs.	Albert Griggs	Worcester, Mass
Wyandotte, Kansas City & N. Western.	W. W. Brownhill		Independence, Mo.

DIRECTORY
OF
Railway Superintendents and Purchasing Agents
THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director. ‡ Ass't. Gen. Supt. § Ass't Supt.

A

Railroad.	*Superintendent.*	*Purchasing Agent*	*Residence.*
Adirondack	C. H. Ballard		Saratoga. N. Y.
Alabama Central	John M. Bridges		Selma, Ala.
Albany & Susquehanna	*C. F. Young		Honesdale, Pa.
Allegheny Valley	David McCargo	John L. Awl	Pittsburg, Pa.
Arkansas Central	James A. Tappan		Helena, Ark.
Atchison, Topeka & Santa Fe	C. F. Morse	C. F. Morse	Topeka, Kansas.
Atchison & Nebraska	L. W. Towne		Atchison, Kan.
Atchison & Nebraska	*Geo. H. Nettleton		Kansas City, Mo.
Alabama & Chattanooga	C. H. Stanton	T. J. Carlile	Meridan, Miss.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Ashtabula, Ohio.
Atlanta & Richmond Air Line			Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	J. H. Holway	Meadville, Pa.
First Division	J. T. Odell		Meadville, Pa.
Second Division	A. L. Dunbar		Meadville, Pa.
Third and Fourth Division	T. A. Phillips		Galion, Ohio.
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage.	C. W. Rogers	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.

B

Baltimore & Ohio	Thos. R. Sharp	Benj. Williams	Baltimore, Md.
Ohio & Chicago Divisions	W. C. Quincy		Columbus, Ohio.
Baltimore & Potomac	Geo. C. Wilkins.	A. W. Sumner	Baltimore, Md.
Bangor & Piscataquis	M. H. Angel	L. H Eaton	Bangor, Maine.
Boston, Barre & Gardner	I. N. Ross		Worcester, Mass.
Boston & Albany	*Wm. Bliss.		Boston, Mass
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & Providence	A. A. Folsom	A A Folsom	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood	Chas. Brigham	Fitchburg, Mass.
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A Dodge	Lyon & Vose	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood	Boston, Mass.
Boston, Lowell & Nashua	W. M. Parker	F. H. Nourse	Boston, Mass.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Brunswick & Albany	C. L. Schlatter		Brunswick, Ga.
Burlington & Missouri River (in Neb.)	Wm. Irving		Omaha, Neb.
Burlington, Cedar Rapids & Minnesota	W W. Walker	S. L. Dows	Cedar Rapids, Ia.
Burlington & South-Western	R. T. Hosford	O. W. Owen	Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo Corry & Pittsburg	David McCargo	N. M. Whitside	Pittsburg, Pa.

C

Cairo & St. Louis	J. L. Hinkley	C. Ritsema	St. Louis, Mo.
Cairo & Vincennes	Henry L. Morrill		Cairo, Ill.
Camden & Atlantic	F. A. Lister	J. L. Wendell	Camden, N. J.
Canada Central, Brockville, & Ottawa	H. P. Alden		Brockville, Can.
Canada Southern	*W. K. Muir		St. Thomas, Ont.
Canada Southern	— Webster	E. W. Porter	St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua, Pa.
Cayuga Lake	J. L. Grant		Ithaca, N. Y.
Central Branch Union Pacific	W. F. Downs	W. F. Downs	Atchison, Kan.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Central Pacific	‡John Corning		Sacramento, Cal.
Western Division	E. C. Fellows		Lathrop, Cal.
Visalia Division	E. C. Fellows		Lathrop, Cal.
Truckee Division	Frank Free		Wadsworth, Nev.
Humboldt Division	R. S. Matteson		Carlin, Nevada.
Oregon Divison	J. A. Fillmore		Sacramento, Cal.
Sacramento Division	J. A. Fillmore		Sacramento, Cal.
Salt Lake Division	R. H. Pratt		Ogden, Utah.
California Pacific Division	A. D. Wilder		Vallejo, Cal.
Central Vermont	J. W. Hobart		St. Albans, Vt.
Western Division	John Schrier		Ogdensburg, N. Y.
Central & Southern Division	Ambrose Arnold		St. Albans, Vt.
Northern & Eastern Division	G. L. Stone		" " "
Rutland Division	J. Burdett		Rutland, Vt.
Harlem Extension Division	J. Burdett		Rutland, Vt.
New-London Northern	G. W. Bentley		New-London, Ct.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Atlanta Division	G. J. Foreacre		Alexandria, Va.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	W. M. S. Dunn	J. A. Netherland	Richmond, Va.
Eastern & Middle Division	J. L. Morrow.		Staunton, Va.
Western Division	J. E. Mallory		
Charlotte, Columbia & Augusta	James Anderson		Columbia, S. C.
Cheshire	R. Stewart	H. H. Stone	Keene, N. H.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt	R. W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	J. B. Mulliken.		Escanaba, Mich.
Madison Division	C. A. Swineford.		Baraboo, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver.		Clinton, Iowa.
Western Iowa Division	John A. Head		Boone, Iowa.
Chicago & Alton	J. C. McMullen	A. V. Hartwell	Chicago. Ill.
Chicago, Burlington & Quincy	R. Harris	D. B. Sibley	Chicago, Ill.
Chicago Burlington & Quincy	‡C. H. Hudson		Chicago, Ill.
Eastern and Middle Division			Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division.	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota.	C. Harris	F. I. Massey	Dubuque, Iowa.
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	*Geo. S. Bowen.	James Penny	Chicago, Ill.
Chicago & Pacific	J. M. Whitman		Chicago, Ill.
Chicago & Paducah			Streator, Ill.
Chicago, Rock Island & Pacific.	Hugh Riddle.	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chicago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.
Chicago & Michigan Lake Shore	*Geo. C. Kimball.	Wm. R. Morrison	St. Joseph, Mich.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Chicago, Danville & Vincennes	L. Pearson.	J. L. Yale	Chicago, Ill.
Chicago, Milwaukee & St. Paul	*S. S. Merrill	John J. Crocker	Milwaukee, Wis.
Chicago, Pekin & Southwestern	W. P. Sisson		Streator, Ill.
Chicago & Canada Southern	D. Edwards		Toledo, Ohio.
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.
Cincinnati, Richmond & Chicago	Lewis Williams		Cincinnati, Ohio
Cincinnati & Martinsville	T. C. Burnside.		Franklin, Ind.
Cin., Cumberland Gap & Charleston	W. J. Taylor		Knoxville, Tenn.
Cincinnati Hamilton & Dayton	Lewis Williams.	P. Hickey	Cincinnati, Ohio.
Cincinnati, Hamilton & Indianapolis	Lewis Williams		Cincinnati, Ohio.
Cincinnati, Lafayette & Chicago	E. H. Waldron	G. G. Hadley	Lafayette, Ind.
Cincinnati, Sandusky & Cleveland	*D. W. C. Brown		Sandusky, Ohio.
Cincinnati, Sandusky & Cleveland	Chas. Howard		Springfield, Ohio.
Cleveland, Columbus, Cincinnati & Ind	E. S. Flint		Cleveland, Ohio.
Indianapolis Division	C. C. Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division.	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough.	Wm. Mullins	Pittsburg, Pa.
Cleveland, Mt. Vernon & Delaware.	G. A. Jones		Mt. Vernon, Ohio.
Cleveland, Tuscarawas Val. & Wheeling	*E. B. Thomas	W. W. Card, *Supt*	Cleveland, Ohio.
Colorado Central	P. J. Nichols.		Golden, Col.
Columbus & Hocking Valley	M. M Green.		Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H.E.Chamberlin.	H. E. Chamberlin.	Concord, N. H.
Connecticut River	John Mulligan.	John Mulligan.	Springfield, Mass.
Connecticut & Passumpsic Rivers		Geo. Killey	Lyndonville, Vt
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Corning, Cowanesque & Antrim	A. H. Gorton	R. J. Burnham	Corning, N. Y.
Cumberland Valley	J. F. Boyd	J. F. Boyd	Chambersburg, Pa.
Cumberland & Pennsylvania	J. A. Millholland		Mt. Savage, Md.

D

Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	J. R. Meckling	J. R. Meckling	Sioux City, Iowa.
Davenport & St. Paul	N. H. Wood		Davenport, Iowa.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware & Hudson Canal Co.	*C. F. Young		Honesdale, Pa.
Albany & Susq. Division	C. D. Hammond		Oneonta, N. Y.
Rensselaer & Saratoga Div	Theo. Voorhees		Troy, N. Y.
Delaware, Lackawanna & Western		G.W. B. Cushing	New-York City.
Delaware, Lackawanna & Western	W. F. Hallstead.		Scranton, Pa.
Lack. & Bloomsburg Div	D. T. Bound		Kingston, Pa.
Morris & Essex Division	Andrew Reasmer		Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus Division	W. F. Hallstead		Utica, N. Y.
Denver & Rio Grande	W. W. Borst	W. S. Jackson	Denver, Col.
Detroit and Milwaukee	S. R.Callaway	John S. Lorimer	Detroit, Mich.
Detroit, Hillsdale & Southwestern	W. F Parker.		Ypsilanti, Mich.
Detroit, Eel River & Illinois	A. B. Southard		Logansport, Ind.
Detroit, Lansing & Lake Michigan	J. B. Mulliken	C. D. Childs	Detroit, Mich
Dorchester & Delaware	J. M. Murphy		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer.	C. V DeForest	Fredonia, N. Y.
Dubuque & South-Western.	J. P. Farley		Dubuque, Iowa
Dutchess & Columbia	C. L. Kimball		Dutchess J'n, N. Y.

E

East Alabama & Cincinnati	B Boyle		Opelika, Ala.
East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern	Geo. Bachelder		Boston, Mass.
Eastern & Maine Central	*C. F. Hatch	C. W. Pratt	Boston, Mass.
Erie & Pittsburg	J. M. Kimball		Erie, Pa
Erie Railway,	E. S. Bowen	C. H. Bowman	New-York City.
Erie	P. P. Wright		Jersey City, N. J.
Eastern Division	E. O. Hill		Port Jervis,N. Y.
Delaware Division	Benj. Thomas		Port Jervis, N. Y.
Rochester Division	M. E. Brown		Rochester, N. Y.
Susquehanna Div.	C. W. Gardner		Elmira, N. Y.
Buffalo Division	R. G. Taylor		Buffalo, N. Y.
Western Division	J. S. Beggs.		Buffalo, N. Y.
Erie & Pittsburg	*J. D. Layng	Wm. Mullins	Pittsburg, Pa.
European & North-American	M. H. Angell	M. H. Angell	Bangor, Maine.
Evansville & Crawfordsville	John E. Martin.		Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.

F

Fitchburg	Chas.L.Heywood.	John Adams	Boston, Mass.
Vermont & Mass. Div.	C. H. Comee		Fitchburg, Mass
Flint & Pere Marquette	Sanford Keeler		East-Saginaw,Mich.
Flushing & North-Side	I. D. Barton		Hunter's Point,L. I.
Flushing & North-Side		A. E. Godeffroy	New-York City.
Fort Wayne, Jackson & Saginaw	D. W. Smith		Jackson, Mich.
Fort Wayne, Muncie & Cincinnati	W. W. Worthington		Fort Wayne, Ind.

G

Galveston, Harrisburg & San Antonio	Hardy Eddins	J. W. Pierce.	Galveston, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Geneva, Ithaca & Athens	R. A. Packer		Ithaca, N Y.
Georgia	S. K. Johnson	John Vaughn	Augusta, Ga.
Gilman, Clinton & Springfield	T. J. Hudson		Springfield, Ill.
Grand Gulf & Port Gibson	G W. McGinnis		Port Gibson, Miss,
Grand Rapids & Indiana.	Wm. O. Hughart		Grand Rapids, Mich.
S. Division	J. M. Matheany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich.
Grand Rapids & Indiana	*W. O. Hughart.		Grand Rapids, Mich.
Grand Trunk	*J. Hickson	John Taylor	Montreal, Canada.
East Division	Henry Bailey		Montreal, Canada.
West Division	W. J. Spicer		Toronto, Canada.
Grand Tower and Carbondale		Wm. W. Harris	Grand Tower, Ill.
Great Southern of Ga. & Fla	M. H. Alberger		Jacksonville, Fla.
Great Western (Canada)	Andrew Watson	Robert Beatty	Hamilton, Ont.
Green Bay & Minnesota	S. B. Kenrick		Green Bay, Wis.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.

H

Hannibal & St. Joseph	*R. S. Stevens	W. J. Hilton	Hannibal, Mo.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin	D. S. Draper	Bridgeport, Ct
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	C. A. Burton		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top.	Geo. F. Gage	B. A. Knight	Huntingdon, Pa.

I

Illinois Central	Jos. F.Tucker		Chicago, Ill.
Illinois Central.	*Jas. C. Clarke	O. Ott	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois Midland	R. G. Hervey	‡P. Campbell	Terre Haute, Ind.
Illinois & St. Louis	W. K. McComas		St. Louis, Mo.
Indianapolis, Bloomington & Western	C. C. Smith		Indianapolis, Ind.
Indianapolis, Bloomington & Western	Geo.B. Wright, Receiver		Indianapolis, Ind.
Indianapolis, Cincinnati & Lafayette	Geo.L. Barringer	E. V. Cherry	Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna		Indianapolis, Ind.
Indianapolis & Vincennes		Wm. Mullins	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward	J. W. Morse	St. Louis, Mo.
Indianapolis, Peru & Chicago	E. C. Murphy	D. Macy.	Indianapolis, Ind.
Michigan City Division			La Porte, Ind.
Intercolonial Railway	Lewis Carvell	Sam. Watson	Moncton, N. B.
International & Great Northern	H. M. Hoxie		Palestine, Texas.

J

Jacksonville, North-Western & S. E.	E. S. Greenleaf		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	Robert Walker		Jacksonville, Fla.
Jeffersonville, Madison & Indianapolis		Wm. Mullins	Pittsburg, Pa.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
Jeffersonville, Madison & Indianapolis	*D. W. Caldwell		Columbus, Ohio.
Jefferson, Madison & Indianapolis,	Horace Scott		Louisville, Ky.
Junction & Breakwater	Tho. Groom		Lewes, Del.
K			
Kansas Central	W. R. Martin		Leavenworth, Kan.
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard	J. F. Barnard	St. Joseph, Mo.
Kansas City, St. Joseph & Council Bluffs	*Geo. H. Nettleton		Kansas City, Mo.
Kansas Midland	W. W. Fagan		Topeka, Kan.
Kansas Pacific	O. S. Lyford		Kansas City, Mo.
Kansas Pacific	O. S. Lyford	J. L. Woods	St. Louis, Mo.
Kaw Valley Division	O. H. Dorrance		Lawrence, Kan.
Smoky Hill Division			Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col.
Kentucky Central	G. H. Pendleton	Geo P. Bowler	Covington, Ky
Keokuk & Des Moines Valley	Geo. H. Griggs	G. E. Kilbourne	Keokuk, Iowa.
Knox & Lincoln	C. A. Coombs	Oliver Morse	Bath, Maine.
L			
Lackawanna & Bloomsburg	D. T. Bound		Kingston, Pa.
Lake Erie & Louisville	I. H. Burgoon		Fremont, Ohio.
Lake Ontario Shore	E. A. Van Horne		Oswego, N. Y.
Lake Superior & Mississippi	G. H. Smith	C. F. Cruft	St. Paul, Minn.
Lake Shore & Michigan Southern	Charles Paine	A. C. Armstrong	Cleveland, Ohio.
Kalamazoo Division	William Wheaton		Kalamazoo, Mich.
Leavenworth, Lawrence & Galveston	B. S. Henning		Lawrence, Kan.
Leavenworth, Lawrence & Galveston	*Geo. H. Nettleton		Kansas City, Mo.
Lawrence & South-Western	R. B. Gemmell	R. B. Gemmell	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
Lehigh Valley		L. Chamberlin	Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa.
Mahony Division	James I. Blakslee		Mauch Chunk, Pa.
New-Jersey Division	H. E. Packer		Bound Brook, N. J.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	T. Hartman		Little Rock, Ark.
Logansport, Crawfordsville & S. W.			Terre Haute, Ind.
Long Island	G. W. N. Custis		Hunter's Point, L. I.
Louisville & Nashville & G. Southern	Albert Fink	G. C. Breed	Louisville, Ky.
Clarksville Division	Jas. Montgomery		Bowling Green, Ky.
Memphis Division	J. T. Flynn		Memphis, Tenn.
Nashville & Decatur Division	James Geddes		Nashville, Tenn.
So. & North Ala. Division	Robert Meek		Birmingham, Ala.
Louisville, Cin. & Lexington	J. McLeod	J. McLeod	Louisville, Ky.
Louisville, New-Albany & Chicago		J. R. Parker	New-Albany, Ind.
Louisville, Paducah & Southwestern	D. F. Whitcomb	D. F. Whitcomb	Louisville, Ky.
M			
Macon & Brunswick	John A. Grant		Macon, Ga.
Maine Central	*Chas. F. Hatch		Boston, Mass.
Maine Central	Payson Tucker		Portland, Me.
Manchester & Lawrence	H. E. Chamberlin		Concord, N. H.
Marietta & Cincinnati	W. W. Peabody	S. L. Campbell	Cincinnati, Ohio.
Marietta, Pittsburg & Cleveland	Jas. McArthur	R. B. Hoover	Marietta, Ohio.
Marquette, Houghton & Ontonagon	*Samuel Schoch	Jas. S. Mott	Marquette, Mich.
Maryland & Delaware	J. L. Caldwell	J. L. Caldwell	Easton, Md.
Memphis, Carthage & North-Western	E. H. Brown		Carthage, Mo.
Memphis & Little Rock	W. E. Smith	W. E. Smith	Memphis, Tenn.
Memphis & Charleston	W. J. Ross		Memphis, Tenn.
Michigan Central	W. B. Strong		Chicago, Ill.
Michigan Central	‡J. R. Ledyard	Allan Bourn	Detroit, Mich.
Grand River Valley Division	C. B. Bush		Jackson, Mich.
Air-Line, So. Bend & Joliet	E. C. Brown		Jackson, Mich.
Bay City Division	T. B. Sargent	D. A. Waterman	Detroit, Mich.
Jackson, Lansing & Saginaw Div.	C. B. Bush		Jackson, Mich.
Mackinaw Division	T. B. Sargent		Bay City, Mich.
Michigan Lake Shore	D. P. Clay, *receiver*		Grand Rapids, Mich.
Midland Railway of Canada	H. G. Taylor		Port Hope, Ont.
Midland Pacific	J. N. Converse	M. A. Showers	Nebraska City, Neb.
Milwaukee, Lake Shore & Western	H. G. H. Reed		Milwaukee, Wis.
Mineral Point	G. W. Cobb	G. W. Cobb	Mineral Point, Wis.
Mineral Range	J. H. Macdonald		Hancock, Mich
Mississippi & Tennessee	M. Burke	M. Burke	Memphis, Tenn.
Mississippi Valley & Western	Guy Wells		Quincy, Ill.
Missouri, Iowa & Nebraska	Col. Henry Hill		Warsaw, Ill.
Missouri, Kansas & Texas	A. B. Garner	G. M. Babcock	Sedalia, Mo.
Cherokee Division	L. H. Sheldon		Parsons, Kansas.
Choctaw Division	S. G. Eddy		Dennison, Texss.
Missouri Division	J. J. Frey		Sedalia, Mo.
Sedalia Division	J. J. Frey		Sedalia, Mo.
Neosho Division	L. H. Sheldon		Parsons, Kansas.
Osage Divsion	C. M. Sheafe		Holden, Mo.
Missouri Pacific	A. A. Talmage	C. W. Rogers	St. Louis, Mo.
Missouri River, Fort Scott & Gulf	B. S. Henning	A. H. Campbell	Kansas City, Mo.
Missouri River, Fort Scott & Gulf	*Geo. H. Nettleton		Kansas City, Mo.
Mobile & Ohio	*A. L. Rives		Mobile, Ala.
Alabama Division	J. S. Walker		Mobile, Ala.
Mississippi Division	E. S. Hosford		Macon, Miss.
Tenn. & Ky. Division	Cecil Fleming		Jackson, Tenn.
Mobile & Girard	W. L. Clark		Columbus, Ga.
Mobile & Montgomery	G. Jordon	G. Jordon	Montgomery, Ala.
Montgomery & Eufaula	B. Dunham	B. Dunham	Montgomery, Ala.
Morgan's Louisiana & Texas		C. A. Whitney & Co.	New-Orleans, La.
N			
Nashville, Chattanooga & St. Louis	J. W. Thomas		Nashville, Tenn.
Naugatuck	G. W. Beach		Bridgeport, Ct.
New-Brunswick & Canada	John Stewart		St. Stephens, N. B.
New-Bedford & Taunton			New-Bedford, Mass.
New-Haven & Derby	E. S. Quintard		New-Haven, Ct.
New-Haven & Northampton	C. N. Yeamans	C. N. Yeamans	New-Haven, Ct.
New-Haven, Middletown & Willimantic	W. A. Waterbury	W. A. Waterbury	Middletown, Ct
New-Jersey & New-York	W. D. Beasley		Jersey City, N. J.
New-Jersey Midland	W. E. Lewis	R. H. Chipman	Wortendyke, N. J
New-Jersey Southern	*W. S. Sneden		Long Branch, N. J
New-Orleans & Selma	T. H. Du Puy		Selma, Ala.
New-Orleans, St. Louis & Chicago	*E. D. Frost	S. H. Edgar, V. P.	New-Orleans, La.
New-Orleans & Mobile	D. B. Robinson	John J. Howell	Mobile, Ala.
New-York & Harlem	Chas. M. Bissell	R. C. Moore	New-York, N. Y.
New-York, New-Haven & Hartford	E. M. Reed	R. N. Dowd	New Haven, Ct.
N. Y. & N. H. Division	John T. Moody		New-York, N. Y.
Hartford Division	C. S. Davidson		Hartford, Ct.
Shore Line Division	W. H. Stephenson		New-Haven, Ct.
New-York, Boston & Montreal	C. L. Kimball		Dutchess Jn., N. Y.
New-York Central & Hudson River	J. Tillinghast		Albany, N. Y.
Hudson River Division	J. M. Toucey	C. V. DeForest	New-York.
Eastern Division	Zenas C. Priest		Utica, N. Y.
Syracuse & Rochester Division	G. H. Burrows		Syracuse, N. Y.
New-York & New-England	H. M. Britton	W. W. McKim	Boston, Mass.
Worcester Division	P. St. M. Andrews		Worcester, Mass.
New-York & Oswego Midland			New-York, N. Y.
New-Jersey Division	G. W. N. Custis		Jersey City, N. J.
Middle Division	H. M. Flint		Middletown, N. Y.
Western Division			Oswego, N. Y.
New-York, Kingston & Syracuse	F. J. Hecker		Rondout, N. Y.
New-York, Providence & Boston	A. S. Matthews	A. S. Matthews	Stonington, Ct.
New Brunswick	Tho. Hoben	W. R. Logan	Fredericton, N.B.
Northern Pacific	*C. W. Mead	E. F. Williams	St. Paul, Minn.
Minnesota Division	J. H. Sullivan		Brainerd, Minn.
Northern Pacific Division	*J. W. Sprague		Kalama, W. T.
Lake Superior & Miss. Division	George H. Smith		St. Paul. Minn.
North-Pennsylvania	S. W. Roberts	F. A. Cornby	Philadelphia, Pa.
Northern Canada	†F. W. Cumberland		Toronto, Can.
Northern Central	*Frank Thomson	A. W. Sumner	Philadelphia, Pa.
Northern (New-Hampshire)	George E. Todd		Concord, N. H.
North-Eastern (South-Carolina)			Charleston, S. C.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
O			
Ohio & Mississippi	*A. N. Chrystie		St. Louis, Mo.
Oil Creek & Alleghany River	C. J. Hepburn		Pittsburg, Pa.
Old Colony	J. R. Kendrick		Boston, Mass.
Omaha & North-Western	J. E. House		Omaha, Neb.
Oregon & California	J. Brandt, Jr.		Portland, Oregon.
P			
Paducah & Memphis	M. Burke		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Paris & Danville	B. L. Baldwin		Danville, Ill.
Passumpsic	G. A. Merrill		Lyndonville, Vt.
Pennsylvania	G. Clinton Gardner		Altoona, Pa.
Pennsylvania	*Frank Thomson	Enoch Lewis	Philadelphia, Pa.
New-Jersey Division	F. Wolcott Jackson		Jersey City, N. J.
Philadelphia Division	W. F. Lockard		Philadelphia, Pa.
Middle Division	J. N. McCrea		Harrisburg, Pa.
Pittsburg Division	Rob't Pitcairn		Pittsburg, Pa.
Tyrone Division	S. S. Blair		Tyrone Pa.
Bedford Division	S. M. Prevost		Bedford, Pa.
West Pennsylvania Division	J. McC. Creighton		Allegheny City, Pa.
Pennsylvania & New-York Canal	A. Mitchell		Wilkesbarre, Pa.
Pensacola & Louisville	C. S. Williams		Pensacola, Fla.
Peoria & Rock Island	John R. Hilliard		Peoria, Ill.
Peoria & Rock Island	J. R. Hilliard, *Rec. and P. Agt.*		Peoria, Ill.
Peoria, Pekin & Jacksonville	John Allen	John Allen	Pekin, Ill.
Petersburg	H. F. Douglas	W. P. Taylor	Petersburg, Va
Philadelphia & Reading	J. E. Wootten	W. S. Wilson	Philadelphia, Pa.
Catawissa & Williamsport Br'ch	D. C. Reinhart		Williamsport, Pa.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Lebanon & Tremont	H. W. Tracy		Pine Grove, Pa.
Philadelphia and Baltimore Central	Henry Wood	Henry Wood	Philadelphia, Pa.
Philadelphia & Erie	W. A. Baldwin		Williamsport, Pa.
Philadelphia & Erie		Enoch Lewis	Philadelphia, Pa.
Western Division	J. W. Reynolds		Erie, Pa.
Middle Division	Edmund L. Tyler		Renovo, Pa.
Eastern Division	Thomas Gucker		Williamsport, Pa.
Philadelphia, Wilmington & Baltimore	H. F. Kenney		Philadelphia, Pa.
Pithole Valley	J. T. Odell		Pithole City, Pa.
Pittsburg, Cincinnati & St. Louis		Wm. Mullins	Pittsburg, Pa.
Pittsburg, Cincinnati & St. Louis	*D. C. Caldwell		Columbus, Ohio.
Eastern Division	J. H. Barrett		Pittsburg, Pa.
Little Miami Division	J. D. Ellison		Cincinnati, Ohio.
Western Division	Jas. R. Shaler		Dennison, Ohio.
Pittsburg, Washington & Baltimore	E. K. Hindman		Connellsville, Pa.
Pittsburg, Ft. Wayne & Chicago	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Eastern Division	George Webb		Pittsburg, Pa.
Western Division	C. D. Gorham		Fort Wayne, Ind.
Port Royal	R. G. Fleming		Augusta, Ga.
Portland & Ogdensburg	J. Hamilton	John E. Donnell	Portland, Maine.
Portland & Rochester	J. M. Lunt	W. H. Turner	Portland, Maine.
Portsmouth, Great Falls & Conway	J. W. Sanborn		Portsmouth, N. H.
Portsmouth	H. E. Chamberlin		Concord, N. H.
Poughkeepsie, Hartford & Boston	J. A. Perkins	A. W. Cable	Poughkeepsie, N. Y
Providence & Worcester	W. D. Hilton	W. D. Hilton	Providence, R. I.
Providence, Warren & Bristol	Waterman Stone		Providence, R. I.
Q			
Quincy, Alton & St. Louis	N. J. T. Dana	N. J. T. Dana	Quincy, Ill.
Quincy, Missouri & Pacific	J. R. Buchanan		Quincy, Ill.
R			
Raleigh & Gaston	A. B. Andrews	A. B. Andrews	Raleigh, N. C.
Richmond, York River & Chesapeake	H. T. Douglas	Hugh Graham	Richmond, Va.
Richmond & Danville	T. M. R. Talcott		Richmond, Va.
Richmond, Fred. & Potomac	E. T. D. Myers	T. L. Courtney	Richmond, Va.
Richmond & Petersburg	Augustus Shaw		Richmond, Va.
Rockford, Rock Island & St. Louis	W. H. Ferry, Receiver	A. E. Lyford	Rock Island, Ill.
Northern Division	Henry Looseley		Rock Island, Ill.
Southern Division	Geo. L. Walker		Beardstown, Ill.
Rome, Watertown & Ogdensburg	J. W. Moak		Watertown, N. Y.
S			
St. Lawrence & Ottawa	R. Luttreil		Prescott, Can.
St. Joseph & Denver City	*L. D. Tuthill		St. Joseph, Mo.
St. Paul & Pacific	E. Q. Sewell	E. C. Becker	St. Paul, Minn.
St. Paul & Sioux City	J. F. Lincoln	J. F. Lincoln	St. Paul, Minn.
St. Louis, Alton & Terre Haute	W. G. Broughton		St Louis, Mo.
St. Louis, Iron Mountain & Southern	Arthur W. Soper	W. S. Cuddy	St. Louis, Mo.
St. Louis, Iron Mountain & Southern	*A. W. Soper		St. Louis, Mo.
St. Louis & South-Eastern	*E. F. Winslow	A. G. Thompson	St. Louis, Mo.
St. Louis Division	George S. Winslow		Mt. Vernon, Ill.
Nashville Division	R. H. G. Minty		Henderson, Ky.
St. Louis, Kansas City & Northern	W. R. Arthur	R. W. Green	St. Louis, Mo.
St Louis Division	W. H. Vaughan		St. Louis, Mo.
Western Division	C. L. Dunham		Kansas City, Mo.
St. Louis, Vandalia, Terre Haute & Ind.	John E. Simpson	C. R. Peddle	Indianapolis, Ind.
St. Louis, Lawrence & Western	E. C. Devereaux		Lawrence, Kan.
St. Louis, Salem & Little Rock		H. A. Crawford	St. Louis, Mo.
St. Louis, Salem & Little Rock	J. W. Blanchard		Steelville, Mo.
Sacramento Valley & P. & S. V.	F. A. Bishop		Sacramento, Cal.
Saginaw Valley & St. Louis	N. M. Merrill	N. M. Merrill	Saginaw, Mich.
San Francisco & Northern Pacific	A. A. Bean	F. H. Gudes	Petaluma Cal.
San Rafael & San Quentin	David Nye		San Rafael, Cal.
Savannah & Charleston	C. S. Gadsden		Charleston, S. C.
Seaboard & Roanoke		E. G. Ghio	Baltimore, Md.
Selma, Marion & Memphis	E. W. Rucker	E. W. Rucker	Marion, Ala.
Selma, Rome & Dalton	M. Stanton		Selma, Ala.
Sheboygan & Fond du Lac			Fond du Lac. Wis
Shenango & Allegheny	I. T. Blair		Greenville, Pa.
Sioux City & Pacific	L. Burnett	L. Burnett	Missouri Valley, Ia.
Sodus Point & Southern	H. Van Vleck		Sodus Point, N. Y.
South-Shore	J. R. Kendrick		Boston, Mass.
South Carolina	S. S. Solomon	A. Mitchell	Charleston, S. C.
Southern Central	Jas. G. Knapp		Auburn, N. Y.
Southern, of Long Island	I. D. Barton		Hunter's Point, L.I
Southern, of Long Island		A. E. Godeffroy	New-York City.
Southern Minnesota	W. C. Van Horne		La Crosse, Wis.
Southern Pacific of California	A. N. Towne		Sacramento, Cal.
North Division	A. C. Bassett		San Francisco, Cal.
Los Angeles Division	E. E. Hewitt		San Francisco, Cal.
Southwestern of Georgia	Virgil Powers		Macon, Ga.
Spartanburg & Union	W. W. Davies		Spartanburg, S. C.
Springfield Athol & Northeastern	John W. Phelps		Springfield, Mass.
Springfield & North-Western	*A. J. Ware		Pekin, Ill.
Staten Island	J. W. Wilbur		New-York, N. Y.
Stockton & Ione	W. G. Miller		Stockton, Cal.
Stonington & Providence	A. S. Mathews	A. S. Mathews	Stonington, Ct.
Sullivan & Erie	Wm. Stevenson		Towanda, Pa.
Summit County	W. M. Riter		Coalville, Utah.
Syracuse Northern	J. W. Moak		Syracuse, N. Y.
Syracuse, Binghamton & New-York	T. Voorhees		Syracuse, N. Y.
T			
Tennessee & Pacific	George Maney		Nashville, Tenn.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	Geo. H. Noble		Marshall, Texas.
Tioga	L. H. Shattuck		Blossburg, Pa.
Toledo, Peoria and Warsaw	A. L. Hopkins, *Receiver*		Peoria, Ill.
Western Division	David K. Smith		Peoria, Ill.
Western Division	William E. Dorwin		Warsaw, Ill.
Toledo, Wabash & Western	Robert Andrews	J. T. Sterling	Toledo, Ohio.
Eastern Division	K. H. Wade		Lafayette, Ind.
Western Division	C. W. Bradley		Springfield, Ill.
Toledo, Canada Southern & Detroit	D. Edwards		Toledo, Ohio.
Troy & Boston	C. W. Moseley		Troy, N. Y.
Toronto, Grey & Bruce	N. Weatherston	W. Watson	Toronto, Can.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
Toronto & Nipissing	J. C. Bailey		Toronto.
Tuckerton	J. Naramore		Tuckerton, N. J.
U			
Union Pacific	S. H. H. Clarke	S. H. H. Clarke	Omaha, Neb.
Mountain Division	S. J. Nichols		Cheyenne, Wyom'g.
Laramie Division	S. T. Shankland		Laramie, Wyoming.
Western Division	O. H. Earll		Evanston, Wyoming.
Utah Central & Southern	John Sharp	S. H. Hill	Salt Lake City
Utica & Black River	J. F. Maynard		Utica, N Y.
Utica, Ithaca, & Elmira	H. P. Goodrich		Ithaca, N. Y.
V			
Vicksburg & Meridian	E. F. Raworth		Vicksburg, Miss.
Virginia & Truckee	H. M. Yerington	C. P. Mason	Carson, Nevada.
W			
Washington & Ohio	R. H. Havener	Lewis McKenzie	Alexandria, Va.
Wash. City Va. Mid. & G. Southern	*G. J. Foreacre		Alexandria, Va.
Welland	William Pay		St. Catherine, Ont.
Westchester & Philadelphia	Henry K. Smith	J. J. Bryant	Philadelphia, Pa.
West-Wisconsin	W. G. Swan		Hudson, Wis.
West-Jersey	W. J. Sewell		Camden, N. J
Western of Alabama	Chas. P. Ball		Montgomery, Ala.
Western of North-Carolina	John M. Rose		Fayetteville, N. C.
Western & Atlantic			Atlanta, Ga.
Western Maryland	*J. M. Hood		Baltimore, Md.
Western Union	D. A. Olin		Racine. Wis.
Wilmington & Western	David Connell		Wilmington, Del.
Wilmington, Columbia & Augusta	James Anderson	James Anderson	Wilmington, N. C.
Wilmington & Weldon	J. F. Devine		Wilmington, N. C.
Winona & St. Peter	S. Sanborn		Madison, Wis.
Winona & St. Peter		R. W. Hamer	Chicago, Ill.
Wisconsin Central	E. B. Phillips		Milwaukee, Wis.
Worcester & Nashua	C. S. Turner	C. S. Turner	Worcester, Mass.
Wyandotte, Kansas City & N. Western	W. Y. Carlton		Independence, Mo.



HAWKES' PATENT FOUNTAIN PEN-HOLDER.

Fits any Pen. Rubber, $2, $2.50, $3.50, and $4.

GEO. F. HAWKES, 66 Nassau Street, New-York.

Noyes' Patent Liquid Cooler and Packing.

For Cooling Railroad Car and Steamboat Journals, and Bearings of all kinds, and for Mixing with other Oils.



The attention of those who are running heavy journals is respectfully invited to the above Liquid Cooler. It has been successfully used for upward of two years, and is constantly growing in favor, as its merits become known, and we are confident that practical men can not fail of being convinced that our preparation deserves their candid attention. What we claim for it is :

That it will Cool a Hot Journal when in Motion,

and extinguish the flame when the box is on fire; that its use will, in a great measure, prevent the occurrence of a hot journal, and save the expense, delays, and annoyances incident thereto; that it will eliminate the heat from a journal at a temperature greatly below the point required to melt the babbitt, preventing an accumulation of heat, and by a timely application save it from destruction; that its non-inflammable elements (where waste is used) permeate the waste and prevent its taking fire; that it keeps the journal smooth and polished, preventing unnecessary friction; that its combination is based upon true scientific principles, which renders it impossible to fail in its results, and is

The only Preparation that will Cool a Hot Journal

while it is in motion, as attested by certificates below; that one thorough application on a hot journal will do more execution in cooling than the constant application of water for half an hour, besides doing it evenly and without loss of time.

Every Railroad or Steamboat

should have a can of the Liquid Packing on board, with the directions for its use pasted upon it, and thus always have at hand the means of effectually cooling a hot journal, and thereby avoid the expense, danger, and trouble from this cause.

AN EXCELLENT AND DURABLE LUBRICATOR

can also be made by combining with the Liquid Cooler and Packing certain quantities of oil, according to the season of the year in which it is to be used, as set forth in the directions. The combination produces a soft, heavy body, that is very essential in hot weather. The Liquid also keeps oil sweet, by preventing oxidation, and its value is greatly enhanced by the additional body which it acquires; and, considering the increased durability, it will be found a matter of considerable economy to combine the Liquid and oil together.

This preparation will be found especially valuable for Steamships, and it has been a leading idea in its combination to especially adapt it for their use. There is, however, no class of machinery, where heavy bearings are used, where it can not be employed beneficially and economically.

On Railroads where Black oil is used as a lubricator exclusively, mixed as directed, especially in warm weather, it will be found a great improvement, and fully equal to lard oil, making a considerable percentage of saving in cost, lessening the liability of hot boxes; and animal oil can be entirely discarded, even in warm weather, and as good results obtained, with less expense, as where all animal oil is used.

The Liquid Cooler and Packing is put up in two forms, one for journals not using waste-packing, such as Steamships, etc., the other for journals on Railroad cars, etc. *In ordering, be particular to state which class of work it is required for.*

We manufacture suitable cans for using the Liquid Packing. Send for circulars containing full description and instruction for use.

WHAT RAILROAD MEN SAY OF IT.

Boston, Lowell and Nashua R.R. Superintendent's Office,
Boston, April 13, 1874.

P. Noyes, Agent:

Dear Sir: We have been using your Liquid Cooler and Packing, and consider it one of the best articles for cooling off hot boxes that we have ever been acquainted with. All of our trains are supplied with a can of it.

John B. Winslow, *Supt.*

East Cambridge, Mass., March 4, 1874.

Person Noyes, Esq.,
Agent Belt and Leather Stuffing Co.:

Dear Sir: In reply to your inquiry in regard to Liquid Cooler and Packing, allow me to say:

I have just sent in a requisition for three barrels, which I trust you have received before this. I will only say in recommending it, that it is the best article I have ever used, and our conductors and engineers all indorse my sentiments.

I have ordered eighteen more cans, which I think will meet your approbation. I intend to have one on every train, and on long trains two, and have them made with inch nozzles, and a cap attached by chain, to prevent thickening; also a packing-iron about fourteen inches long, attached to a slot in the can, to be used in stirring up the Liquid, and also for drawing the waste out on the front side, and crowding it in on the back side, before putting the packing in. This little packing-iron I find very essential, as it is always at hand, and will prevent delay in searching for a suitable article in times of emergency. Yours truly,

JOHN F. CROCKETT, *M. M., Boston, Lowell, and Nashua R. R.*

Person Noyes, Esq.,
Agent Belt and Leather Stuffing Co.:

Chicago, Dec. 10, 1873.

Dear Sir: The barrel Liquid Packing sent on trial is approved, and you will please send us five barrels more. Yours, H. I. HIGGINS, *Purchasing Agent C., B., and Q. R. R.*

Chicago, March 23, 1874.

P. Noyes, Agent: Please forward to C., B., & Q. R. R., and send bill of same to this office, eight barrels of Liquid Packing and Cooler, same as purchased of you before, and send as soon as possible. H. I. HIGGINS, *Purchasing Agent.*

Agent Belt and Leather Stuffing Co.: Chicago, Ill., May 7, 1874.

Dear Sir: You will please forward to the C., B., and Q. R. R. ten barrels Liquid Packing.

H. I. HIGGINS, *Purchasing Agent C., B., and Q. R. R.*

Mr. Noyes: Fitchburg, Mass., Aug. 20, 1872.

Dear Sir: I have used your Liquid Packing for the past four months, and am perfectly wer-satisfied that it is the most effectual article ever in use for the purpose claimed. I have just ordered another barrel. If all railroad companies would adopt your Liquid Cooler, I think they would find a saving of nearly 20 per cent, when used with mineral or black oil, according to your directions. JACOB MARSH, *Master Car Builder, Troy and Greenfield R. R.*

Mr. P. Noyes: Salem, Mass., Aug. 7, 1872.

Dear Sir: I have been using your Liquid Packing for cooling car journals, for some time past, and have been well pleased with it. I have had occasion to use it a number of times under Pullman Cars, and it has been a complete remedy in every case of hot journals.

Every train should be provided with it, as it is a saving of time and expense in the running of trains, provided it is applied and cared for according to directions for using.

J. P. SOMERBY, *M. C. B. of Eastern Railroad.*

P. Noyes, Esq: Albany, Nov. 1, 1872.

Dear Sir: I received the barrel of Liquid Cooler and Packing you sent me for trial, and gave it out to our most experienced conductors, to use according to directions. Below please find their report:

"We, the undersigned, Freight Conductors on the Eastern Division of the N. Y. C. & H. R. R. R., have used the Liquid Cooler furnished by Mr. Jones, and find that when we arrive at a station with a hot journal, the Liquid Packing cools it sufficiently by the time we arrive at the next station to use the black oil, and then have no trouble in getting through with it. It is the best we ever used.—R. H. Fisher, A. W. Getmans, R. H. Heath, Wm. Hess, Conductors E. Div., N. Y. C. R. R. I. Ferguson, Conductor H. R. R. R."

JOSEPH JONES, *M. M., N. Y. C. & H. R. R. R., E. Div.*

CERTIFICATES OF NAVAL OFFICERS.

[COPY.]
Bureau of Steam Engineering,
Navy Department,
Washington, April 12.

Chief Engineer's Office,
U. S. Navy Yard, Washington, March 30, 1875.

Commodore Thos. H. Patterson,
U. S. N., Commandant:

Sir: In obedience to your order of December 24, 1874, to test the Liquid Cooler of Person Noyes, of Boston, Mass., and report upon the results, I respectfully submit the following:

This Liquid is a composition possessing both lubricating and cooling qualities, and when mixed with other oils, gives it more body and prevents oxidation.

The test was made upon a journal 9½ inches in diameter and 14 inches long, making seventy revolutions per minute. The journal was rough and in bad condition at the commencement of the test, and was allowed to become hot; the Liquid was applied and in a few minutes it was reduced to a good working condition. Several experiments were made, all with equally favorable results. The Liquid can be mixed with other oils, or, in extreme cases, with fresh or salt water, the latter being preferable, as it amalgamates more readily with the Liquid, which at the same time retains its lubricating qualities. It is very efficient for cooling hot journals, and the cost is about one half that of sperm oil.

The Castor Oil Belt Dressing is an excellent article for preserving belts. It protects the surface from the atmosphere, keeps them pliable, and makes them adhere closely to the pulley, and more durable. Very respectfully, your ob't serv't,

(Signed) EDWARD FITHIAN, *Chief Engineer, U. S. N.*

Person Noyes, Agent: Boston, April 15, 1875.

Dear Sir: I have been using your Liquid Cooler for some six months past, and can say of it that in all respects it is far superior to any thing of the kind I have ever used. After having tried many cooling mixtures, down even to cold water, upon one of our engine bearings, without success, your Cooler has worked a complete change, to our entire satisfaction. I also find that with one third of your Liquid and two thirds oil, it has the desired effect of keeping cool bearings and lubricating them perfectly at the same time. In some extreme cases it may be expedient to use more than one third of the Liquid. With what experience I have had, I find it the best article for all bearings, and use the same on all machinery in my department. Would cheerfully recommend it to all parties who have charge of machinery for economy and durability, and, both afloat and ashore, engineers will find it of great benefit to them.

I have also tried your Castor Oil Belt Dressing on my belts, and consider it the best article for softening and preserving the leather that I have ever used.

Yours, most truly,

THOS. J. MARSTON, *Navy Yard, Boston.*

P. Noyes,
Agent Belt and Leather Stuffing Co.: Boston, April 15, 1875.

Sir: I have had in use for some time past, your Liquid Cooler, and having given it a thorough trial, I can say that I regard it as being the best article for cooling a hot journal that I have ever used. I have tried it on thrust bearings, which is the worst place for heat that I have on board ship, and it cooled it down splendidly. I find by mixing one part of your Cooler with about two parts lard oil that my anxiety was lessened considerably, after having it in use forty-eight hours, regarding hot bearings. By attention to mixing and stirring, it will cool down the bearing. I save about one third by mixing Liquid Cooler with lard oil. I would recommend any one to try it, both for its economy and cooling properties.

Yours, very truly,

A. MORRISON, *Chief Engineer Steamship Carroll.*

Send for a Barrel. No charge unless it does all we state.

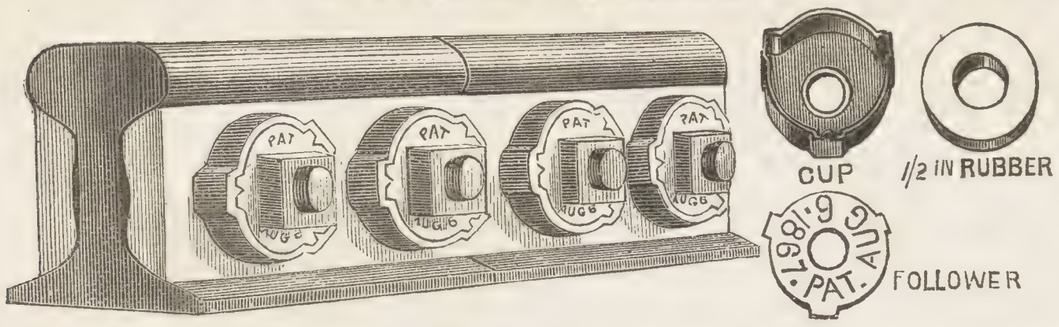
Manufactured by the Belt and Leather Stuffing Co.,

47 INDIA STREET, BOSTON.

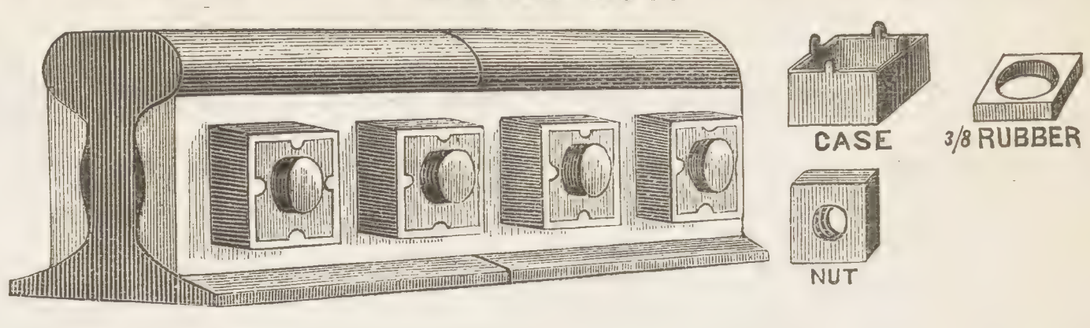
Sold by L. G. Tillottson & Co., New-York.

PRATT'S PATENT COMPENSATING FISH-PLATE JOINTS.

"SPRING CUP-WASHER."



"SPRING NUT."



Track Bolts and Nuts are constantly subjected to a vibration and jar. One large item of expense is for wrench-work and replacement of bolts and nuts already off.

Most of the contrivances for removing this trouble are failures. They do not remove the cause of the trouble. This can only be done by some elastic material, which will absorb the vibration and prevent its reaching the nuts. Experience proves that permanent elasticity can not be obtained by using wood, which is perishable, or steel, which can not be made of uniform temper. In our inventions, the elastic packing of rubber between the nut and the plate absorbs the jar or vibration, insulates the nut, and by removing the cause of the trouble removes the trouble itself. Among its advantages are these:

1st. It saves the expense of wrench-work and loss of nuts.
2d. The rubber absorbs the blow given by the wheels at the joint, in such manner as to prevent fracture of rails at the joint, and accidents resulting therefrom.
3d. The track is made noiseless.
4th. Rails are saved from pounding out at the ends, and the thread of the bolts and nuts from stripping.

The practical value of these inventions is more fully demonstrated by the two million joints now long in use.

Manufactured and Sold by

THE PRATT MANUFACTURING COMPANY,

NO. 71 BROADWAY, NEW-YORK,

Manufacturers and Dealers in all kinds of RAILWAY TRACK SUPPLIES; also, New-York Agents for the Tuttle & Whittemore Co., Naugatuck Conn., Manufacturers of REFINED MALLEABLE IRON CASTINGS, from Patterns to order.

Special attention given to MALLEABLE IRON CASTINGS for Railroad Car construction.

VOSE, DINSMORE & CO.,

Manufacturers of

RAILWAY CAR SPRINGS

OF EVERY DESCRIPTION,

INCLUDING THE "COMBINATION ELLIPTIC SPRING."

Special attention is called to our Patent **CLIFF ELLIPTIC SPRINGS** for Freight and Passenger service. See advertisement, page ii.

Steel Rails, Locomotive and Car Tires, Elliptic Springs and Cast Steel of all descriptions.

JOHN C. WYMAN, General Manager.

194 Lake Street, Chicago.
720 North Second Street, St. Louis.

32 Warren St.,
NEW-YORK.

Railroad and House Painters' Colors,

Made from the Very Best Materials and especially prepared for Painting Railroad Cars, Station-Houses or Depots, Bridges, etc., etc.

BUYERS WILL FIND IT GREATLY TO THEIR ADVANTAGE TO EXAMINE OUR PAINTS WHEN PURCHASING.

Sample Cards furnished upon application.

Manufactured by BAXTER, BELL & CO., 21 Park Place and 18 Murray St.,

NEW-YORK,

Manufacturers and Importers of White Lead, Zinc Paints, Oils, Varnishes, Glass, Putty, Whiting etc., Fine and Ordinary Colors, Dry and in Oil.

HOADLEY & PERKINS
Manufacturing Co.

COR. FRANKLIN AND CENTRE STS.

(New-Haven Railroad Freight Depot),

MANUFACTURERS OF

BRASS COCKS

For Steam, Water, and Gas.

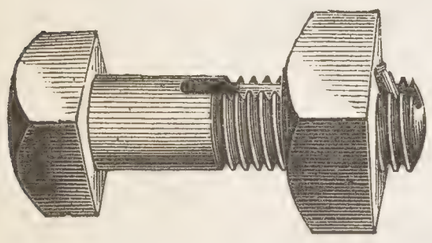
☞ *Illustrated Catalogue and Price-List furnished on application.*

Wm. Courtenay, President. Chas. F. Cobb, Secretary.

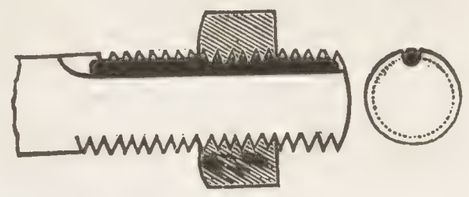
The Lock-Nut and Bolt Co., of New-York,

Office, No. 17 DEY STREET, New-York.

Manufacturers of all kinds of BOLTS, for FISH-PLATES, CARS, BRIDGES, MACHINERY, CARRIAGES, &c., with the



"Cumming Nut-lock,"
Patented
June 16, 1868,
August 23, 1870.



SECTIONS.

Unequaled for CHEAPNESS, SIMPLICITY & EFFECTIVENESS.

This simple device, as will be seen by the engravings, consists of a groove being cut in the threaded part of a screw bolt into which is placed a key of copper wire, or other soft metal; when the nut is screwed on, it cuts a thread on the key, thereby making it impossible for the key to get out until the nut is taken off. When the nut is screwed up to its place, that part of the key over which the nut has passed is riveted up against the nut with a small punch, destroying the thread on the key. The nut, therefore, can not move backward until force is used, as with a wrench.

The groove can be rapidly cut with a simple machine designed for the purpose.

Experience has proved this device absolutely reliable, and it is the cheapest of all known devices for the purpose. By its use, old bolts on which the nuts have become too slack for use can be made as good as new, making it a great saving to railroad companies and others in that item alone. It is cheaper than a check-nut.

If the bolt should become slack from shrinking of timber or other causes, *the nut will always remain firmly attached to the bolt*, and, with the wrench, can be screwed up *any distance*, and the wire riveted up any number of times, or can be taken off without injury to the nut or bolt.

This is the only method in use that locks the nut firmly to the bolt without regard to place or surroundings, all others require some attachment that holds the bolt in its position, and a washer or other attachment to keep the nut from turning.

Directions for Use.—Place the copper key in the slot, pointed end out, and beveled side up, in such a position that when the nut is screwed to its place about three-eighths of an inch of the key will project beyond its outer face. Then screw the nut to its place *over the key*, allowing it to cut its own thread in the copper. Then take a narrow flat set punch, and rivet the projecting part of the key *solidly* against the outer face of the nut. To tighten the nut: screw it up, and rivet the key tighter. To remove the nut: simply apply the wrench and unscrew the nut. It will cut its own way out through the copper. The same key can be used several times, by moving it outward a few threads in the slot.

DITTMAN'S

STAR NUT-LOCK.

Fig. 1

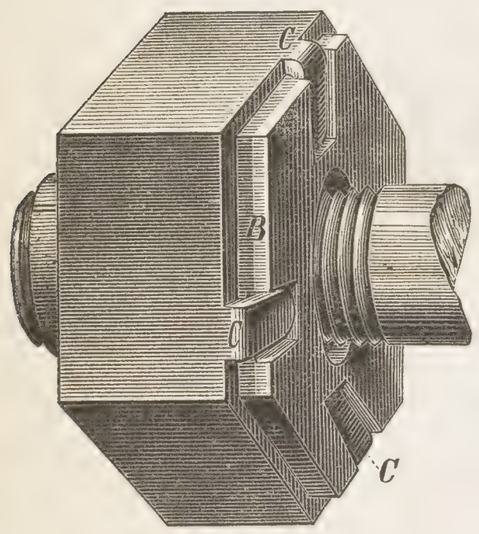
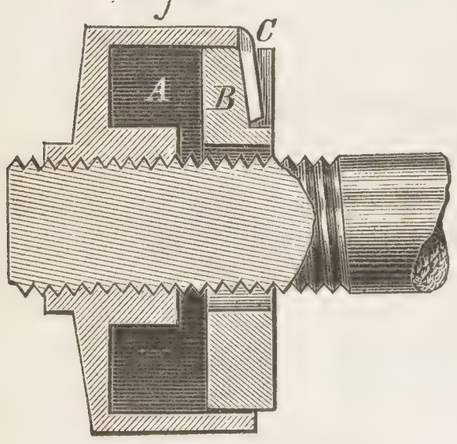


Fig. 2



Patented September 8, 1874.

The Nut-Lock herewith illustrated in perspective (Fig. 1) and section (Fig. 2) is so constructed as to prevent the backward rotation of the Nut under the influence of jars and jolts, and also to take up automatically the expansion or contraction of the bolt due to changes of temperature.

This Nut-Lock is not to be used in connection with Fish-Plates for a period of three years and five months, but for all other purposes it can be used. After that period has elapsed, it can be used with Fish-Plates.

We will guarantee the Nut-Lock not to be an infringement on any other invention. All parties infringing on our rights will be dealt with according to law.

License will be granted to manufacture the above Nut and samples furnished upon application to the

STAR NUT-LOCK CO.,

Leacock P. O., Lancaster Co., Pa.

SALAMANDER

Anti-Incrustation Boiler Fluid,

FOR STATIONARY, LOCOMOTIVE AND MARINE BOILERS.

Harker & Co., Proprietors and Manufacturers,

RICHMOND, VA.

☞ *Absolutely harmless to the Metal of the Boiler.* ☜

Sole agent for Maryland, Delaware, Pennsylvania, New-Jersey, New-York and New-England States,

W. F. CARTER,

Send for Circular. *57 South Street, Baltimore, Md.*

HARRISBURG FOUNDRY

AND

Machine Company,

HARRISBURG, PA.

Manufacture all kinds of Machinists' and Car-Builders' Tools, for working Iron, such as Lathes, Planers, Slotting Machines, Horizontal Drilling and Boring Machines, Vertical Drills, all sizes, Shaping Machines, Bolt Cutters, Nut Tappers, Car Wheel Borers, Hydraulic Wheel Press, Axle Lathes, etc. Patent Sectional Tubular Boiler, safety and great economy at moderate cost.

Also Oil Tank Cars, Boiler and Sheet Iron work of all kinds, Foundry Cupolas, Cranes, Ladles, etc.

SAMUEL FISK, General Manager.

GEO. DUNBAR & CO.'S

Railway-Car Stove.



The above cut represents our new Railway Wood-Burning Car Stove, which for Style and Economy is unsurpassed by any in the market.

GEO. DUNBAR & CO.

Dealers in

General Railroad Supplies,

19 FEDERAL ST., BOSTON.

General Selling Agents for Boston Car-Spring Co. and Chrome Steel Co.

THE UNION WHITE LEAD MANUFACTURING COMPANY. PURE

Union White Lead Manufacturing Co.,

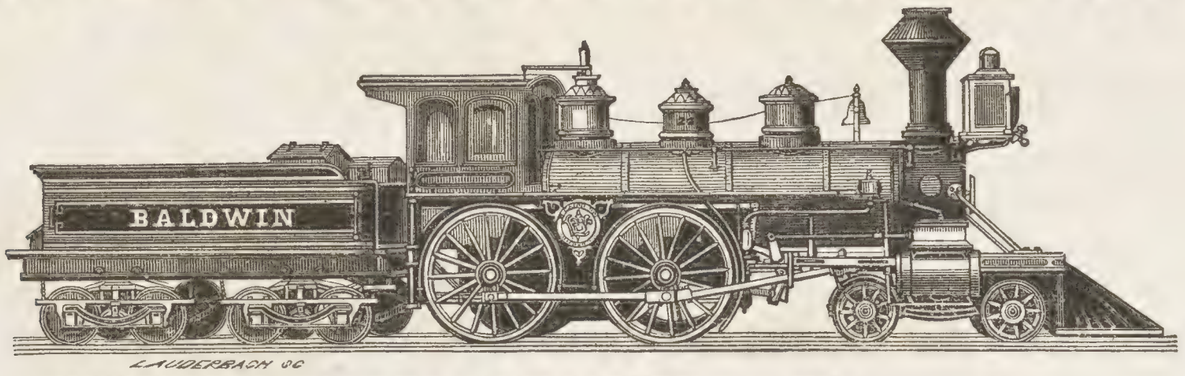
26 Burling Slip, New-York.

B. W. HOW, Secretary. JAMES HOW, President.

MANUFACTURERS OF

WHITE LEAD, RED LEAD, LITHARGE, ORANGE MINERAL.

BALDWIN LOCOMOTIVE WORKS.



BURNHAM, PARRY, WILLIAMS & CO., Philadelphia,

MANUFACTURERS OF

LOCOMOTIVE ENGINES,

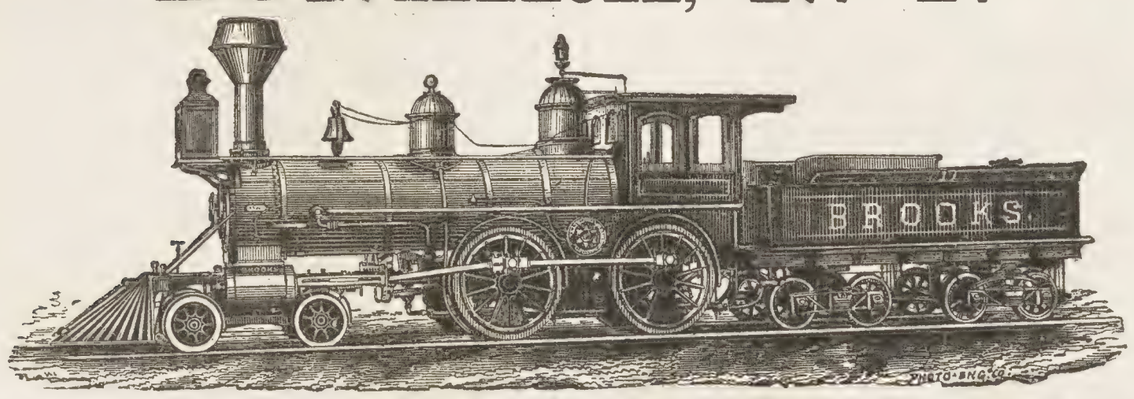
Especially adapted to every variety of Railroad use, including **Mine Engines and Locomotives for Narrow-Gauge Railways.**

All Work thoroughly interchangeable.

GEO. BURNHAM, CHAS. T. PARRY, EDWARD H. WILLIAMS, WM. P. HENSZEY, EDWARD LONGSTRETH, JOHN H. CONVERSE.

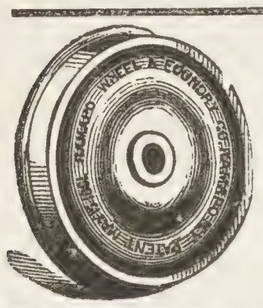
BROOKS LOCOMOTIVE WORKS,

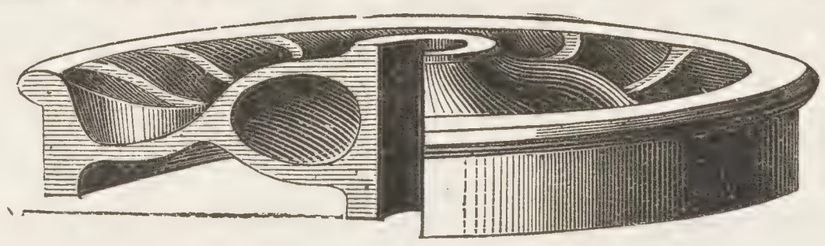
DUNKIRK, N. Y.



Orders solicited for Locomotives adapted to every class of Railway service.

M. L. HINMAN, Sec. and Treas. H. G. BROOKS, Pres. and Supt.







RAMAPO WHEEL AND FOUNDRY CO.,

MANUFACTURERS OF

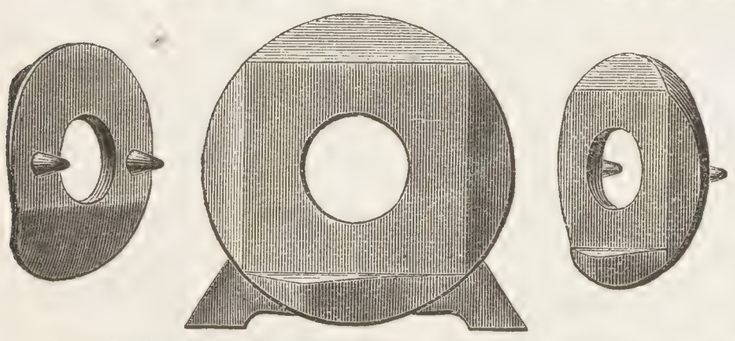
Chilled Wheels for Drawing-Room and Sleeping Coaches,

LOCOMOTIVES, TENDERS, PASSENGER AND FREIGHT CARS.

GEO. CHURCH, Pres't and Treasurer. W. W. SNOW, Sup't and Gen'l Manager.

RAMAPO, ROCKLAND COUNTY, N. Y.

KEEN'S PATENT ROCKING NUT-LOCK WASHER.



The only absolutely Perfect Nut-Lock in the market, combining Economy, Simplicity, and Perfect Safety.

The large cut represents the Fish-Plate Washer; the small one on the right is adapted to wood, a bottom view of which is shown in the left-hand cut with beveled side, and the spurs which penetrate the wood. They are in use on a number of Railroads, and give entire satisfaction, supplying the place of Jam-nut and Washer on wood, besides being cheaper and decidedly better. On Fish-Plates, the cost is about the same as that of the Jam-nut.

In ordering Fish-Plate Washers, specify height of rail and square of nut. In all other cases use M. C. B.'s standard size nut, flat side next the washer.

⅝ inch Nut, - - 1⅛ inch square. | ⅞ inch Nut, - - 1⅝ inch square.
¾ " " - - 1⅜ " " | 1 " " - - 1⅞ " "

VOSE, DINSMORE & CO., *Agents,* **GEO. W. KEEN & CO.,** *Proprietors,*

32 Warren St., New-York. ***22 NASSAU ST., NEW-YORK.***

SURE CURE FOR

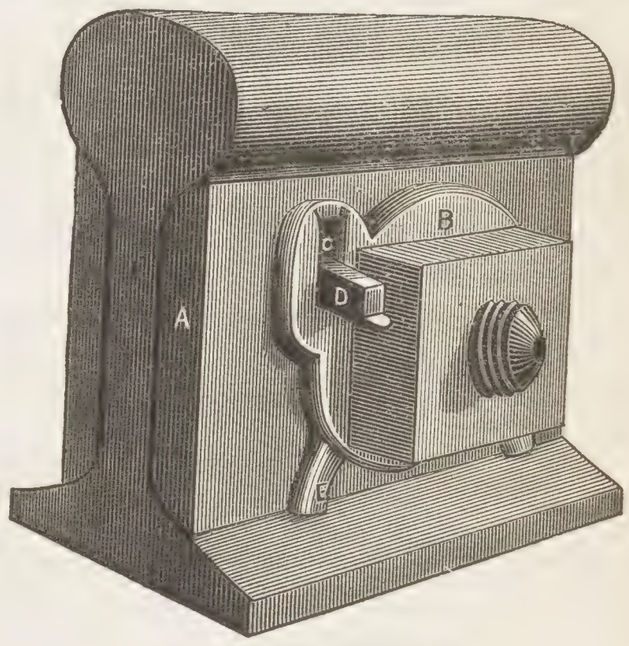
HOT JOURNALS.

See Bridges' Advertisement, Page XII.

PURDIE'S PATENT

Safety Washer,

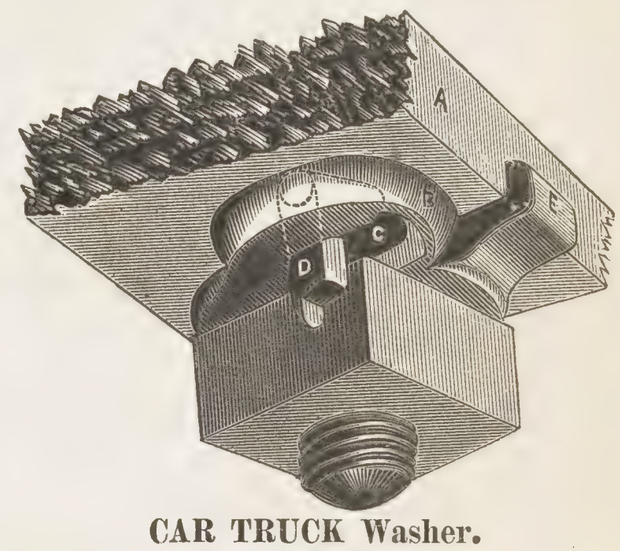
A Positive Nut-Lock, made of Malleable Iron.



For FISH PLATE.

EXPLANATION OF CUT.

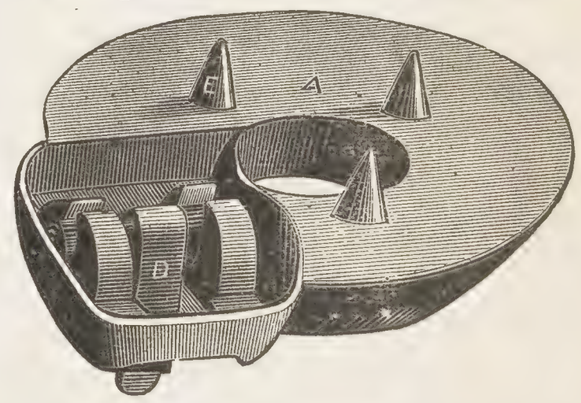
A, Fish plate. *B*, Washer, with projecting feet. *C*, Cavity, into which the dog, *D*, swings, on screwing up the nut. *D*, Pivoted dog which falls by side of nut when screwed home.



CAR TRUCK Washer.

Adapted for use on fish-plate bolts, car trucks, wagons, mowing machines, wood-work of all kinds, or for any purpose where bolts and nuts are used.

Cheap, Effective, and Durable.



Reverse side for WOOD-WORK, showing Method of Pivot Swing.

Will fit on old or new work, no alterations or special tools needed, requiring no rubber or wood for compressing or bending to hold the nut. The dog being in position to lock at any time required, by turning down by the side of the nut when screwed home; should the bolt or thread give any, so as to become loose, the dog will still hold the nut from turning back, and the nut can be screwed up as readily as by the old method.

Have been practically tested for two and a half years on many Railroads, giving unqualified satisfaction, one Railroad alone having them on over 2,500 cars

Cast-iron washers for timber or bridges furnished to any size or weight.

Samples and price-lists forwarded on application to

JOHN PURDIE,

MANAGER OF

Safety Washer Manufacturing Company

No. 311 MAIN STREET,

BUFFALO, N. Y.

J. F. SULLIVAN,
DESIGNER AND ENGRAVER ON WOOD
No. 23 JOHN ST. NEW YORK

SOLID HEAD
NICKEL-PLATED SCREWS.
ADAMS NICKEL-PLATING and MFG. CO.
South Windham, Ct.

THE
PETERSBURG CAR COMPANY,
Petersburg, Va.,
Are now ready to receive orders for all kinds of
FREIGHT CARS.
These works are supplied with the most improved machinery, and have switch connections with broad and narrow gauge. They are prepared to furnish Rolling Stock with the utmost promptness, of the best materials and workmanship, and at the lowest prices.
JOHN W. FLEMING, Superintendent.
T. L. H. YOUNG, President.

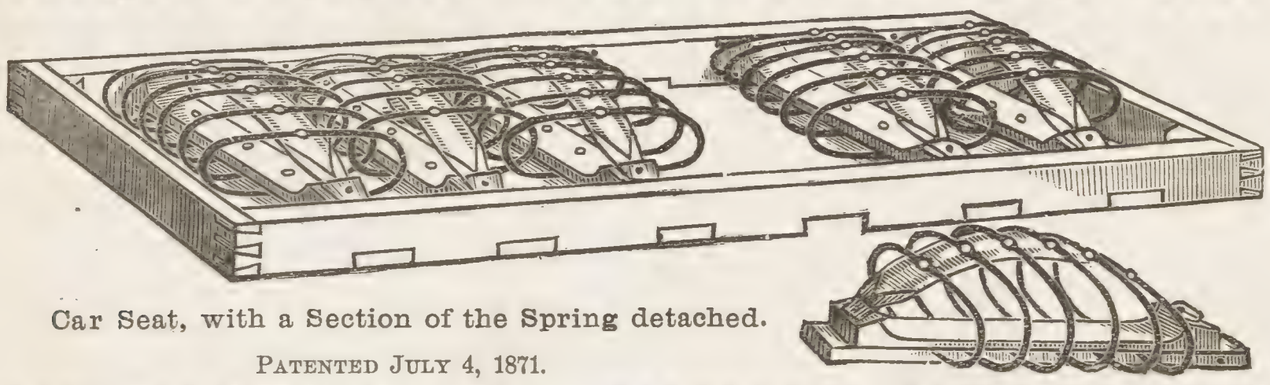
ATLAS WORKS,
28th Street, Pittsburgh, Pa.
Make a *Specialty of Freight Car Forgings* and *Castings* delivered to Shops. Also *Locomotive Cylinders, Frogs and Switches.* Address,
THOS. N. MILLER, President.

PLANING AND MATCHING MACHINES
UNIVERSAL WOOD WORKERS
TRADE MARK
WOOD WORKING MACHINERY.
BENTEL, MARGEDANT & CO.
HAMILTON, OHIO.
Send for Catalogue and Price List.

CRANK PLANERS.
Superior Design and Workmanship, Extra Heavy (1400 lb.)
DOWN, ANGULAR & CROSS-FEED,
TO PLANE 12x16x15.
The Hull & Belden Company, Danbury, Ct.

IRON AND STEEL
DROP FORGING.
Of Every Description, at Reasonable Prices.
The Hull & Belden Company, Danbury, Ct.

COBB'S ELLIPTIC STEEL SPRING.



Car Seat, with a Section of the Spring detached.

PATENTED JULY 4, 1871.

FOR CAR SEATS AND SPRING MATTRESSES FOR SLEEPING CARS.

These Springs have been in successful operation on a large number of the leading railroads in the United States for over three years.

OFFICE OF PULLMAN PALACE CAR COMPANY,
CHICAGO, January 1, 1873.

Z. COBB & SONS, CHICAGO, ILL.:
GENTS: Have used your Patent Elliptic Steel Spring *exclusively* for the last three years in over **300** of our cars, and are satisfied of their superiority over all other springs in use.
A. B. PULLMAN.

Z. COBB & SONS, 292 West Adams Street, CHICAGO.
BRANCH OFFICE: Wilmington, Del.

NEW-HAVEN
CAR HEAD-LINING WORKS,
NEW-HAVEN, CONN.

In consequence of the large and increased demand for our "CAR HEAD LININGS" we have been obliged to remove our Manufactory from WORCESTER, MASS., to NEW-HAVEN CONN., where new and commodious buildings have been erected, with increased conveniences for promptly supplying our customers, and we beg to invite your attention to our new and SUPERIOR FACILITIES for furnishing

"CAR HEAD LININGS"

OF THE MOST APPROVED STYLES AND PATTERNS

Either Full Decorated, Part Decorated, Encaustic, or Printed and Plain,

At Short Notice and in the Most Satisfactory Manner.
Orders will be received at the Factory, in New-Haven, Ct., or by

L. G. TILLOTSON & CO.,
No. 8 Dey Street, New-York,

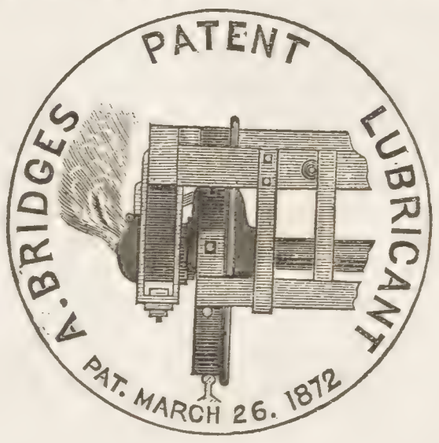
MANUFACTURERS AND DEALERS IN RAILWAY AND TELEGRAPH SUPPLIES OF EVERY DESCRIPTION.

F. J. LAWRENCE,
MANUFACTURER OF
Railroad Car Head Linings,
15 Hamilton Street,
ALBANY, N. Y.

Particular attention paid to Drawing-Room and Sleeping Car Linings.

Refers to Hon. W. WAGNER, Esq., Pres't of Sleeping Car Co.

HOT JOURNALS ENTIRELY PREVENTED
BY THE USE OF



For Railroad Car Journals and other Bearings.

In presenting this Lubricant to the notice of Railroad and Steamboat Managers and Operators in Machinery generally, I do so with a practical knowledge of its merits, and with confidence that it will be found to possess invaluable qualities as a

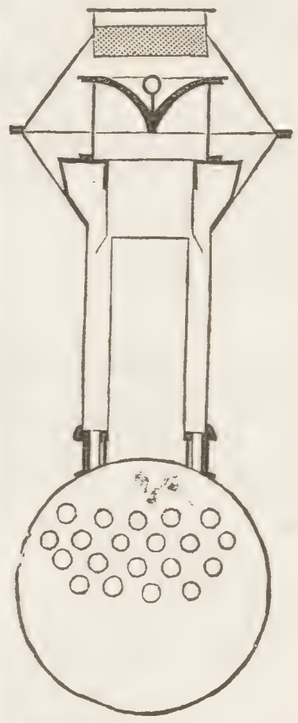
Lubricator and Counteractor of Friction.

It has been in use, during the past two years, on a number of Railroads and Steamers, and is highly approved of.
Parties wishing to make a practical test of the Lubricant will be furnished with sample on application.

ALBERT BRIDGES, Patentee,
MANUFACTURER AND DEALER IN
RAILWAY SUPPLIES and MACHINERY,
No. 46 CORTLANDT STREET,
SEND FOR CIRCULAR. NEW-YORK.

HERRICK'S CAR WORKS,
OSWEGO, N. Y.,
Are in full operation and stocked with selected material for manufacturing
Box, Platform and Coal Cars,
Prices and terms to suit the times. Orders solicited. Address,
WM. H. HERRICK, Proprietor.

ANTHONY ROSS & JAMES McINTOSH'S
SPARK-CONSUMING SMOKE-STACK,



For Coal and Wood Burning Locomotives.

Patented June 23, 1874.

MEMPHIS, TENN.

We are now prepared to lay before the Railroad public a Smoke-Stack, which has been used for twelve months on the Memphis and Charleston Railroad, on Passenger, Freight, and Switching Engines, carrying the most combustible article—Cotton—without any danger of Fire whatever from sparks, or annoyance to passengers.
Railroad Companies wishing to use them can be furnished with working drawings by sending size of cylinder of engines to be used upon.
For rights to use the same and full particulars, apply to

ANTHONY ROSS,
Master Mechanic,
Memphis and Charleston Railroad,
MEMPHIS, TENN.

Steel Stamps, Steel Letters, and Figures,
Of every description, and for all purposes.
NAME PUNCHES
For marking tools, patented articles, etc., made in the very best manner, at short notice and on reasonable terms, by
RICHARD H. ROGERS,
ENGRAVER,
Die Sinker, and Steel Letter Cutter,
50 FULTON STREET, NEW-YORK.
Orders by mail promptly attended to.

The "Eclipse" Fan-Blower,



For Blacksmiths, Coach-Makers, Machinists, Contractors, and all having use for Smith or Forge fires. Suited to any fire, right or left side; works easy, blast regular, and made at will for light or heavy work; only occupies 12×20 inches floor space; cheaper and better than bellows.
ALSO
TIRE BENDERS and TUYERE IRONS.
Circular and Price free. Address
EZRA F. LANDIS,
LANCASTER, PA.
Or T. H. KING & CO., San Francisco, Cal.

THE ROCKY MOUNTAIN VERMILION PAINT

Is "Nature's Compound" of COPPER, MERCURY, LEAD, and IRON.

A PURE OXIDE OF METALS, CONTAINING NO EARTHY MATTER.

Hence we claim and are prepared to *prove* that it is the

Best and Cheapest Paint in the Market.

Properly mixed, we will guarantee it to Cover Double the Surface and wear twice as long as ordinary paints. It will not *Peel*, *Scale*, *Crack*, or BLISTER, though subjected to high degrees of heat. It will effectually prevent the corrosion of metals even in mid-ocean. Warranted *superior* to Red Lead, or any other lead, for any and all purposes for which Paint is required. We are fully aware that these statements will be more or less discredited by many, and although we might produce hundreds of testimonials corroborating our claims, even then doubts would exist; and as the most convincing proofs are obtained by actual test, we simply ask you to *TRY IT!* Submit it to any reasonable test you please, and you will soon find that we have not *overstated the facts*, and that *your interest*, and the interests of *all concerned*, will be subserved by the use of the

ROCKY MOUNTAIN VERMILION PAINT.

ROCKY MOUNTAIN VERMILION PAINT CO. Trade Mark.

Furnished dry, in whole and half barrels containing 200 pounds and upward; also ground in pure linseed oil, in barrels or kegs; also in gallon packages, mixed ready for use.

ALL ORDERS SHOULD BE ADDRESSED TO

WILLIAM H. COREY,

General Agent for the United States and Territories,

No. 20 SABIN STREET, PROVIDENCE, R. I.

CAUTION.

Owing to the great superiority of this Paint over all others, causing a constantly increasing demand, some unscrupulous parties are selling inferior articles of paint under the name of

ROCKY MOUNTAIN.

Be sure that each package bears the Trade-Mark of this Company, as herein shown, without which none is genuine.

LEHICTON PAINT AND LINSEED-OIL MILLS,

C. E. HECHT, Proprietor,

EASTON, PA.

Pure Raw and Boiled Linseed Oil, White Leads and Zincs, Colors, Putty, Varnishes, Japans, etc.

SOLE MANUFACTURERS OF THE

CAR COLORS,

so long used and so highly recommended as the cheapest and best covering for all outside work ever offered. The CAR COLORS are all ground in Pure Boiled Linseed Oil, and packed in all sized kegs and barrels.

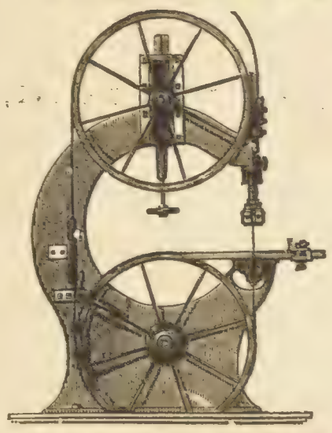
Samples of all the Colors, with Price-List, will be furnished on application.

Sole Agency and Manufactory of Smith & Dean's Patent Crystal Enamel (Filler) for Coach and Car Work.

Wood Cutting Machinery

FOR

Railway-Car Building, Ship-Building, and Band Sawing.



SEND FOR CIRCULAR.

The Celebrated French "**M. PERIN & CO.**" Band Saw Blade,

ANY LENGTH AND WIDTH.

RICHARDS, LONDON & KELLEY,

ATLANTIC WORKS,

22d, Above ARCH, PHILADELPHIA, PA.

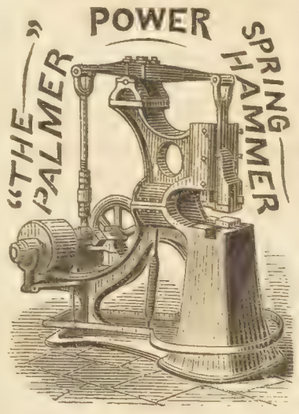


THIS HAMMER

Awarded the First Premium of a Silver Medal

AT THE

American Institute Fair, N. Y. City, Nov., 1873.



Superior in every point to any modification of the Trip Hammer.

Simple, Powerful,

Efficient and Cheap.

Four Sizes now being Built.

For Prices and Descriptive Circulars, address the Manufacturers,

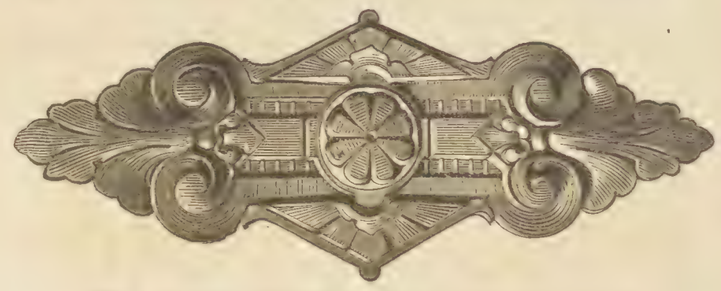
S. C. FORSAITH & CO.,

Manchester, N. H.,

Who are also Builders of the

Abbe Bolt-Heading Machine.

Artificial Wood Ornaments.



We invite the attention of the trade, including

Furniture Manufacturers, Builders, Interior Decorators, Stair-Builders, CAR BUILDERS, Architects, Steamboat Builders, Organ Manufacturers, and others,

To our variety of styles of ornaments, made to match black walnut in color, and which are perfectly fitted for use where not exposed to the weather. They have been sold extensively for several years, and have given entire satisfaction—so that all who have once used them have become constant consumers. They are artistic in design and unequaled in execution, being the production of the best artists, carvers, die sinkers, and moulders.

These ornaments hold glue and screws as well as carvings. They do not warp or crack. They are unaffected by changes of temperature, and withstand dampness as well as furniture. They will polish in every respect equal to wood, either with shellac, oil, wax, or varnish, and with less trouble, as there is no open grain to fill. They will gild or bronze beautifully by simply sizing, without any other preparation.

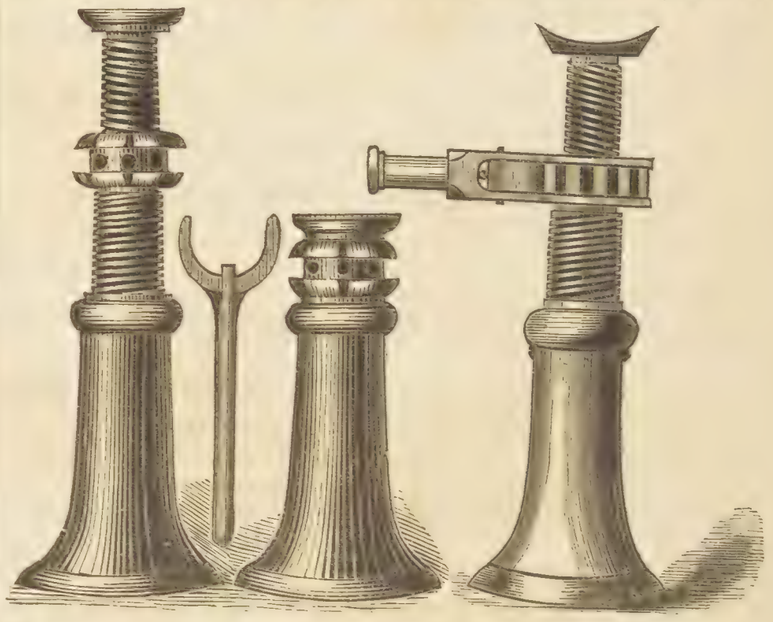
Our goods can be purchased of the Hardware houses in the various cities of the Union. Circulars mailed on application to

WILLIAM B. GLEASON & CO.,

Cor. West Camden Street, and Boston & Providence R. R.,

BOSTON, MASS.

BALL'S PATENT TELESCOPE JACK.



Hot and Cold Punched Nuts, Bolts, Lag Screws and Washers. Belting, Packing Hose, Rubber Springs, Car Trimmings, Steam Pumps.

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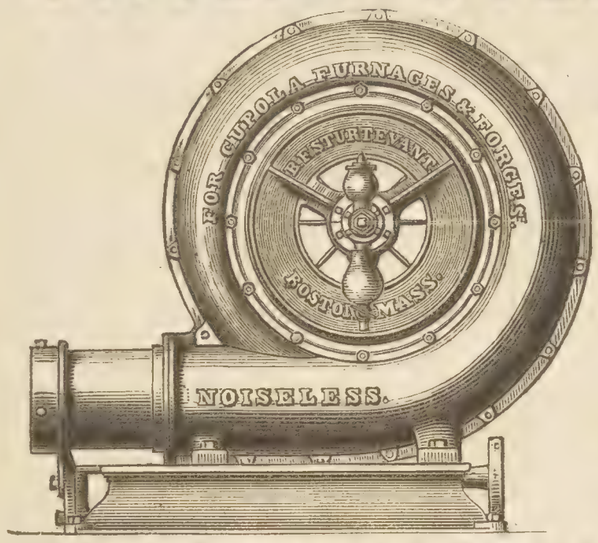
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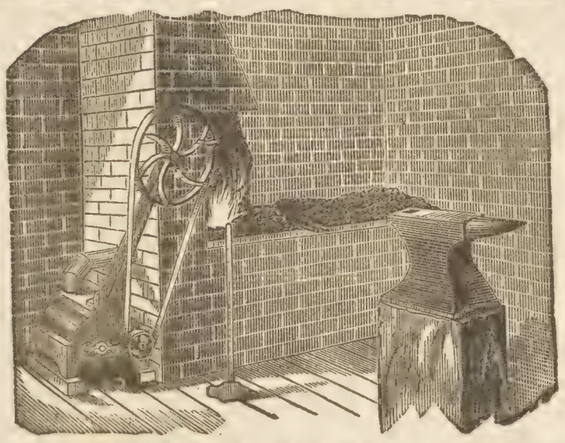
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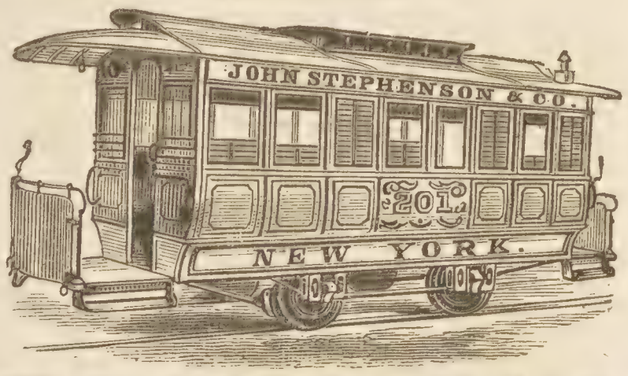
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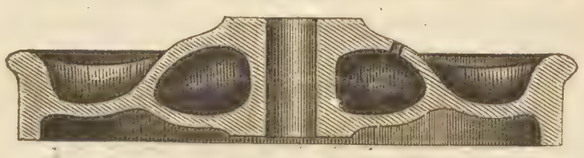


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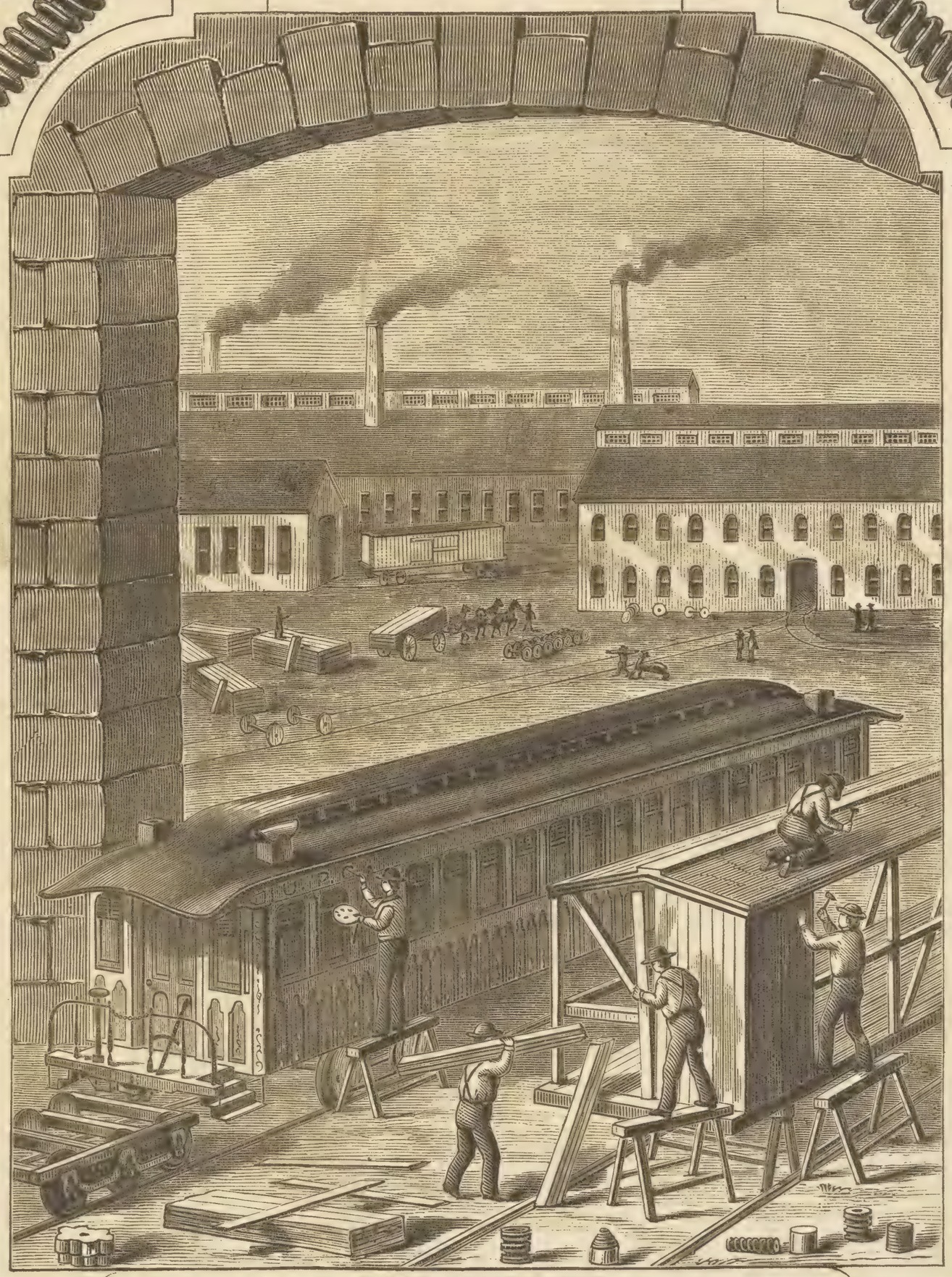
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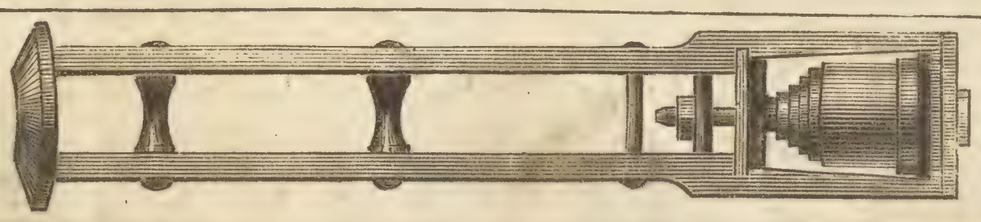
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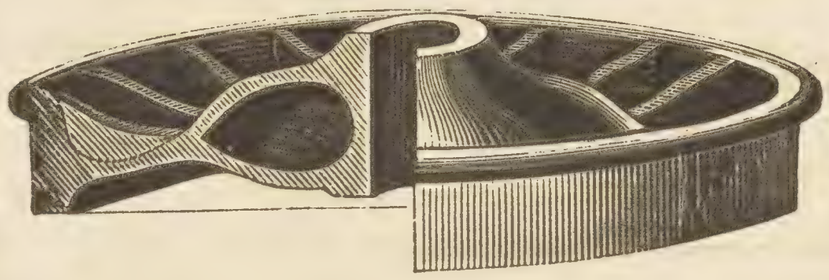
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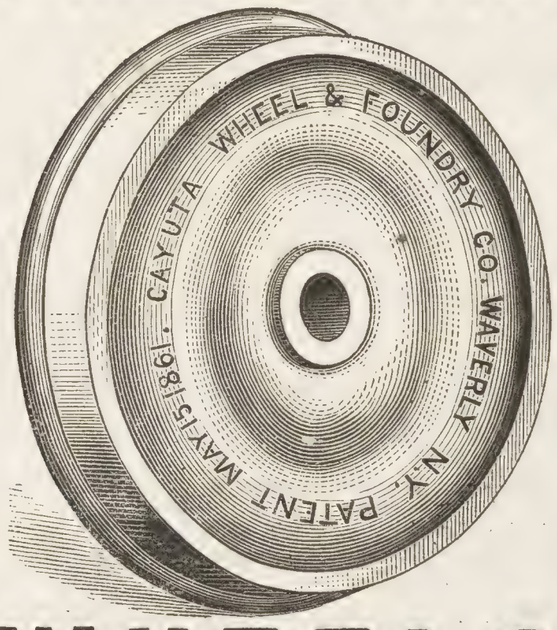
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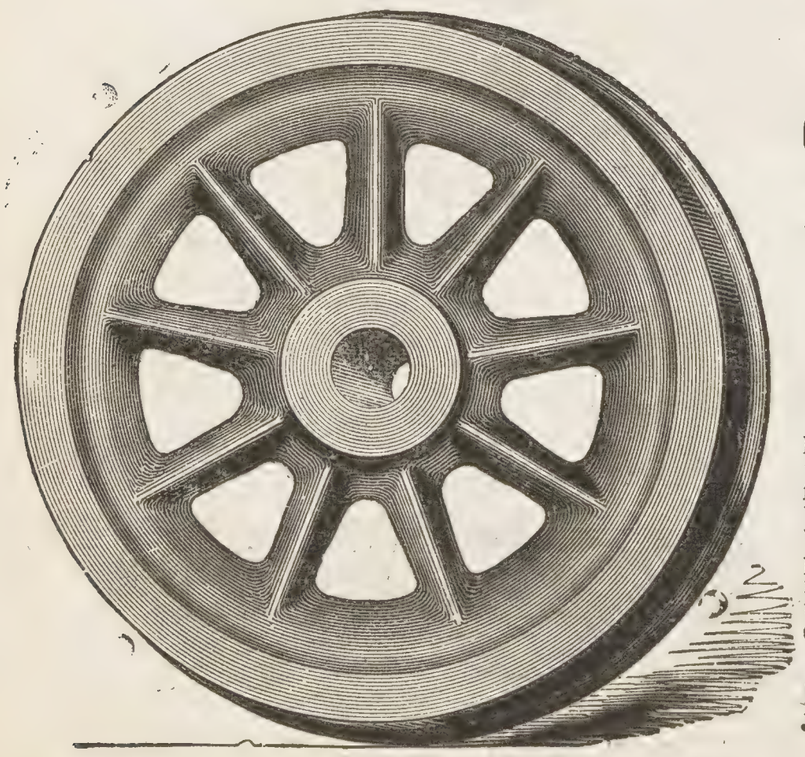
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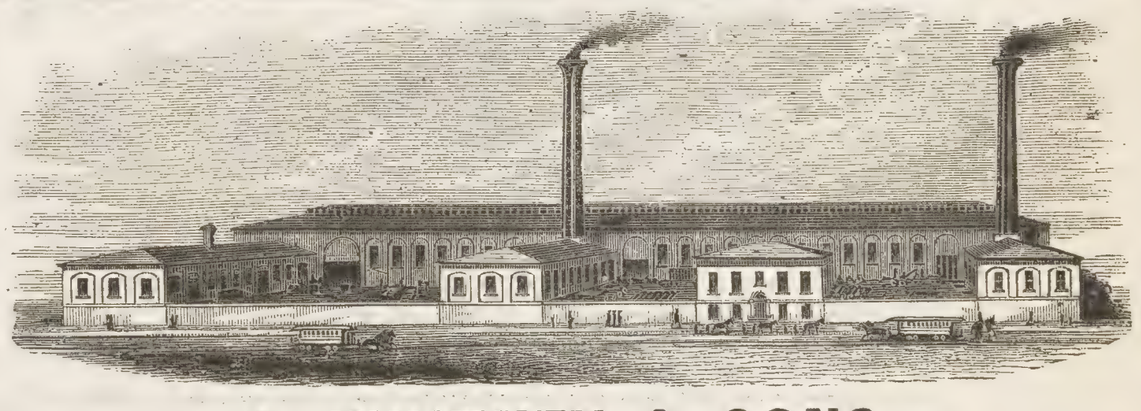
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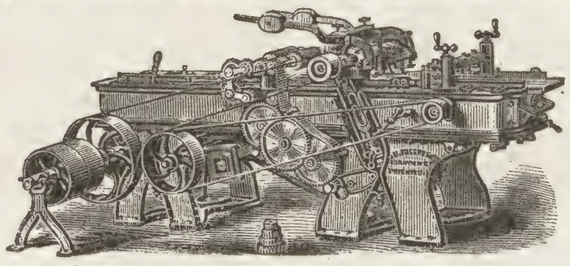
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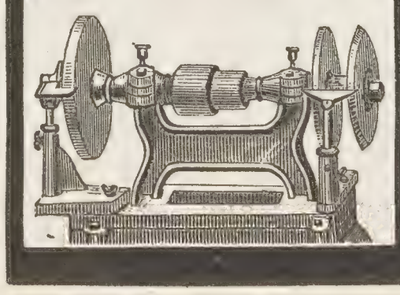
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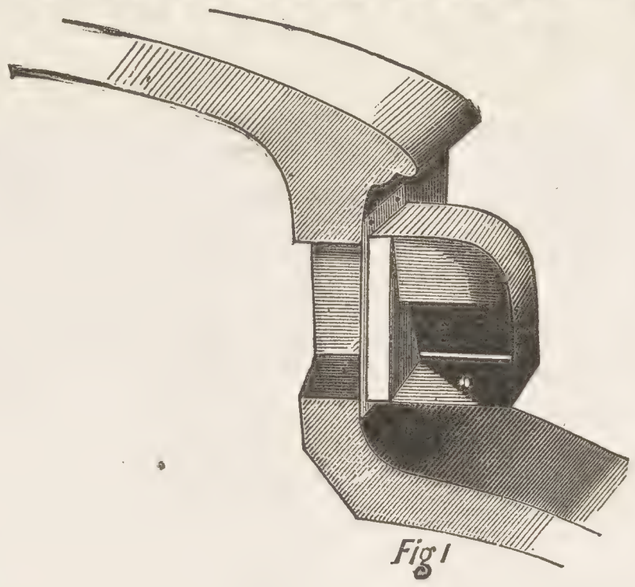


Fig 1

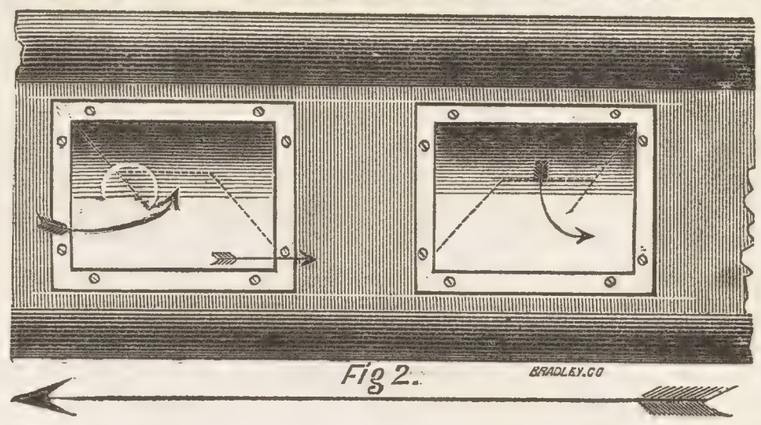


Fig 2.

THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place, it is always in readiness, and runs itself independent of all employees.

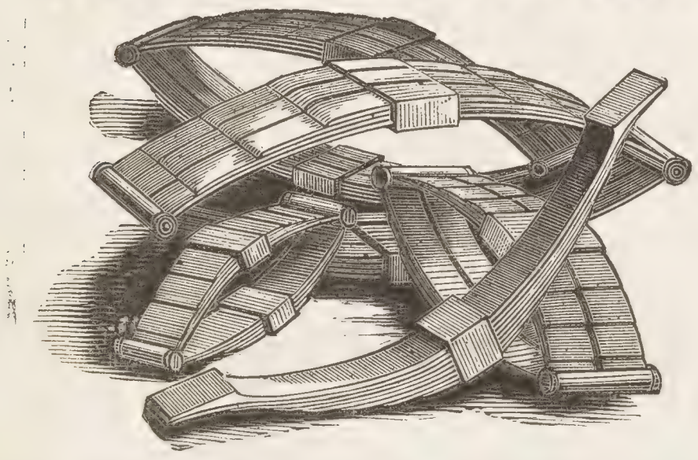
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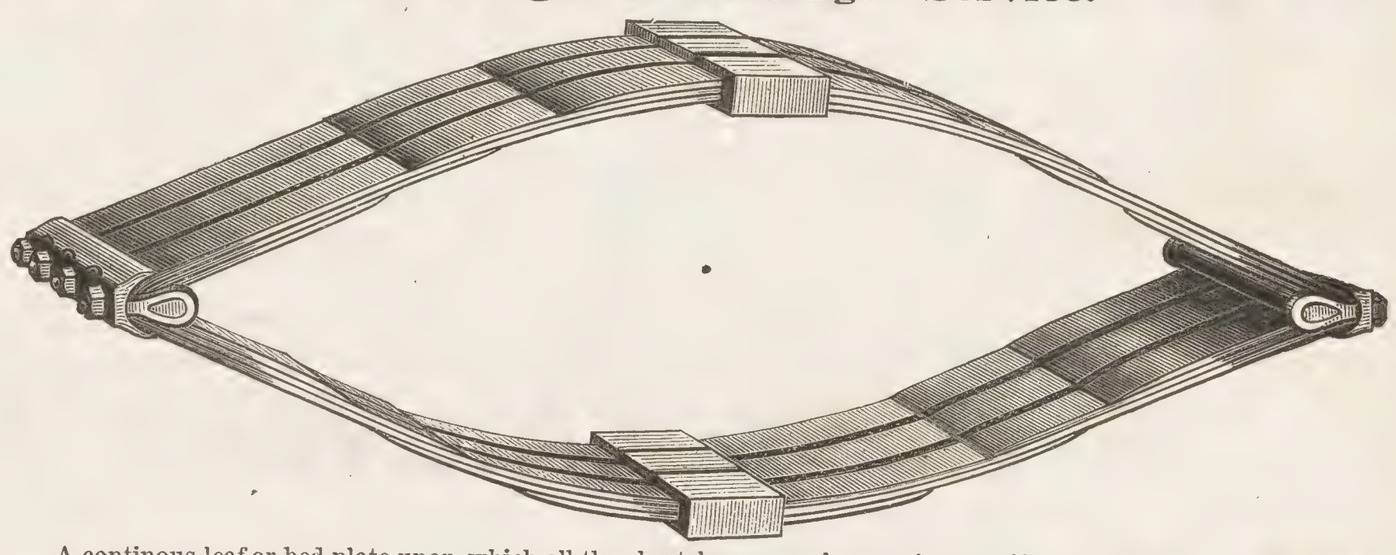
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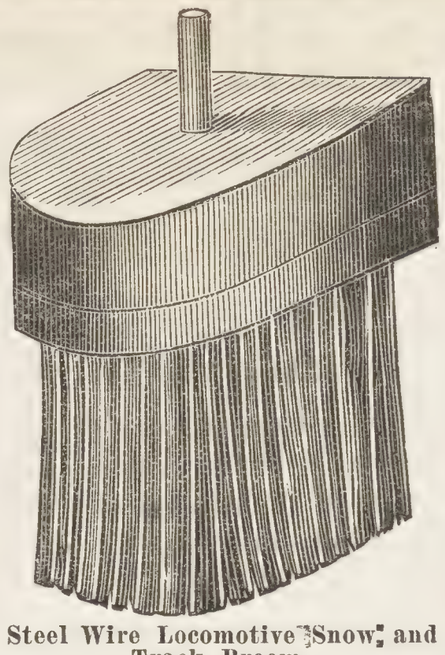
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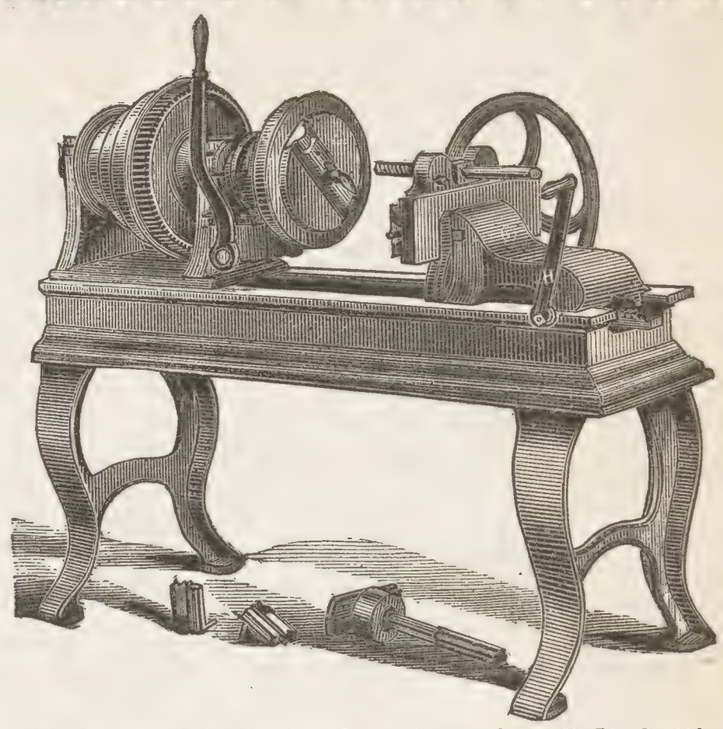
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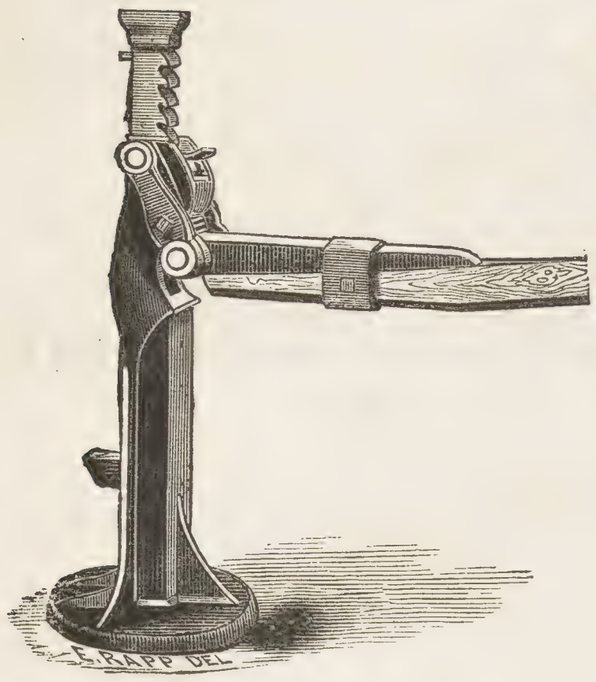
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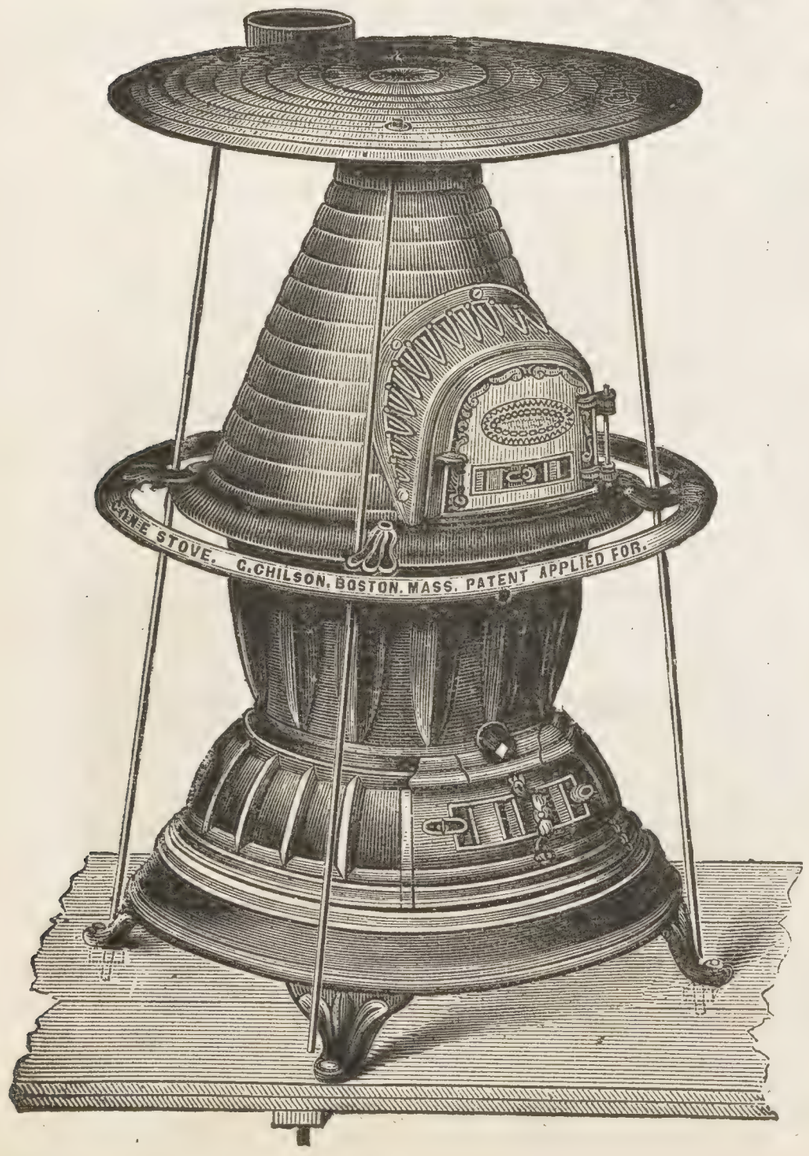
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1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.

2. The broad radiating disk prevents the heat from ascending to the upper part of the car or room, but distributes and throws it down to the floor, thoroughly warming the lower currents of cold air in the car or room for a great distance around the Stove, thus securing the long desired object of making the *lower part of the car and floor comfortably warm, especially for the feet.*

3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stoves.

4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.

5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*

6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories, Stores, Offices*, RAILROAD CARS, and STATION HOUSES, *School Rooms, Workshops, etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

The BOSTON AND PROVIDENCE RAILROAD COMPANY have over two hundred of these Stoves in use, and the BOSTON AND ALBANY and several other Roads are adopting them, with the most perfect success.

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Superintendent's Office, Boston, April, 1873.

GARDNER CHILSON, Esq.: *Dear Sir:* We have about two hundred of your new "Cone" Disk Stoves in use, (a part of them for nearly five years,) for warming Passenger Cars and Stations. I can truly say that they have given entire satisfaction. These Stoves possess many important advantages over any other we have ever used, viz.: for warming the floor and displacing the cold air in the lower part of the car, whereby they are rendered much more comfortable, especially for the feet, than by any other plan known to us. The Stove is more economical in the consumption of fuel, more substantial in construction, and consequently requiring less repairs than any other in use, and so securely constructed as to prevent fire from getting out of the stove even should the car be *overturned.* I cheerfully give my testimony in favor of this Stove, and commend it to all Railroad Managers. Yours, etc., A. A. FOLSOM, *Superintendent.*

Numerous other testimonials received from Railroads and other persons having these Stoves in use in Halls, Stores, etc., may be seen at office. Bolts are not required except for Cars and Steamboats.

Chilson's Improved Celebrated Cone Furnaces, for setting in Brickwork or in Portable Casings, Chilson's Unrivaled Double-Oven Brick Cooking-Range; Chilson's New and Splendid Arlington Portable Range; Chilson's very Superior Arlington Cooking Stove; Parlor, Office, and Store Stoves, Parlor Grates, Registers, Ventilators, etc.

Special attention given to putting up Furnaces and Ranges, and the ventilation of buildings in any part of the country.

☞ Nothing but strictly first-class work is manufactured by me. ☜

Warerooms, Nos. 99 & 101 Blackstone Street, Boston.

FOUNDRY AT MANSFIELD, MASS.

GARDNER CHILSON.

RAWLINS' METALLIC PAINT,

WYOMING.

Warranted Fire, Water, and Weather Proof.

Will cover more surface and outwear any paint manufactured.

CHICAGO, BURLINGTON, AND QUINCY RAILROAD,
MASTER PAINTER'S OFFICE,
AURORA, ILL., March 15, 1875.

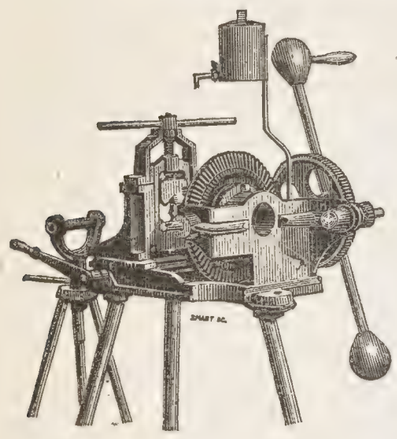
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GENTLEMEN: I have had your IRON PAINT in test for about six months, and find it one of the best, if not the best, Iron Paints I have ever seen. *I put two coats of it, mixed with boiled oil, on a piece of sheet-iron, and buried it in* STRONG BRINE, *about six months ago, and it has stood the test, and* DOES NOT SHOW ANY SIGNS OF RUSTING THROUGH THE PAINT. I have also used it on Locomotive work, and find that it COVERS FAR MORE SURFACE than any Iron Paint I have used.

Very respectfully yours,
D. C. COOLEY.

CHASE'S

Pipe-Cutting and Threading Machine.



This important tool is designed to fill a want long felt by STEAM AND GAS FITTERS AND MACHINISTS for cutting and threading pipes rapidly and cheaply. An Apprentice Boy, with one of these, can do more work than Two Men with old appliances under our old system. No PIPE SPLITTING! NO BEVEL INSIDE OR OUT! It cuts threads and makes nipples for all sizes of pipes, from ½ to 2 inches. Stronger than any machine made. A full set of collars for making nipples goes with the machine.

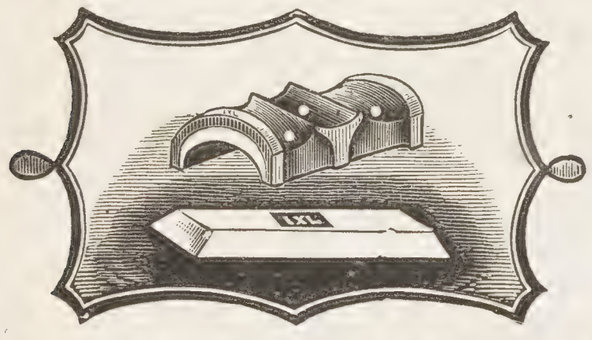
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120 Front St., New-York.

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For sale by MORRIS, TASKER & CO., Philadelphia, New-York, and Boston; and W. H. BANKS & CO., 34 and 36 South Canal Street, Chicago.

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I X L METAL COMPANY

OFFICE AND FOUNDRY,

No. 7 North Third Street, ST. LOUIS, MO.

Sole Proprietors and Manufacturers of the

I X L ANTI-FRICTION METAL

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Railroad Companies will find a great saving in their expenses, and very little trouble from hot boxes, by using these bearings. A sample set for a trial sent free of charge, by sending a Brass for pattern. Mills, Steamboat Companies or others, will find this a superior Composition for Bearings.

EMPIRE PORTABLE FORGES

NO BELTS, BELLOWS OR CRANKS,
THE BEST MADE.
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"DEAD STROKE" POWER HAMMER.

IMPROVED ADJUSTABLE CRANK PIN.
STRIKES BLOW HEAVY OR LIGHT, FAST OR SLOW.
Prices Reduced Jan. 1st, 1875.
The Hull & Belden Company, Danbury, Ct.

IRON CLAD PAINT.



Address IRON CLAD PAINT COMPANY,

CLEVELAND, OHIO.

This Company owns and manufactures under WM. GREEN'S several patents, and is the only Company in the world that makes Paint from pure hard Lake Superior Iron Ore, such as is used in furnaces for making Pig Iron.

The most Economical, Most Fireproof, Most Waterproof, Most Durable, and Most Useful Paint made.

Used by L. S. & M. S. Ry. I. & St. L. R. R.
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T. W. & W. Ry. L. S. & T. V. R. R.
Etc., etc.

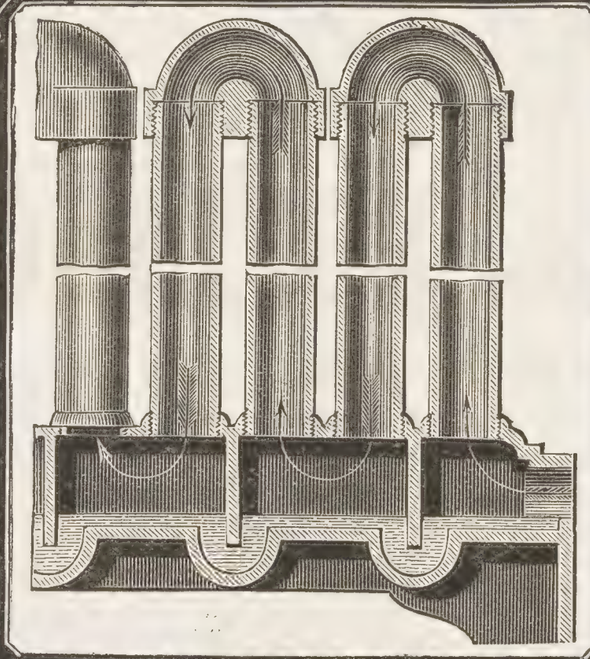
OFFICE OF PURCHASING AGENT
LAKE SHORE AND MICH. SOUTHERN RAILWAY,
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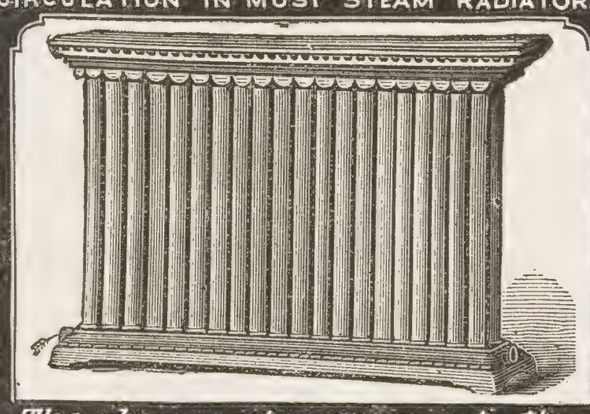
GENTLEMEN: Your "Metallic Paints" known as "*Iron Clad Paints*" have, in the past six years, been extensively used and thoroughly tested by this Company, as to their *covering capacity, durability, and resistance to atmospheric changes*—latter "paint destroyer"—the most difficult to overcome in outside paints. We can emphatically accord them the highest position over any paint heretofore produced, for Cars, Roofs, Stations, Bridges, etc. The monthly increase of our orders is the best evidence that the Paint is constantly growing in favor with our mechanics.

Very respectfully yours,
A. C. ARMSTRONG,
Gen'l Purchasing Agent L. S. & M. S. R. R.

Don't THROW AWAY YOUR Money



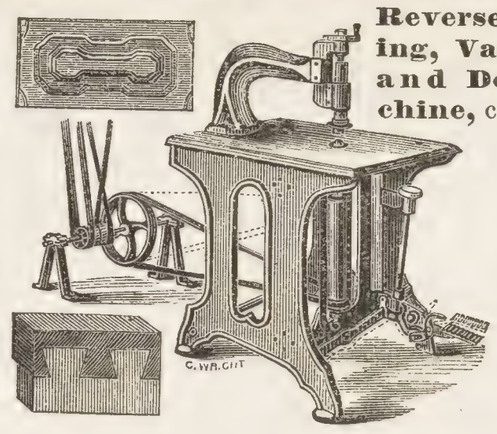
BY USING INFERIOR HEATING APPARATUS.
A MASS OF IRON, COLD, OR AT BEST BUT PARTIALLY WARM IS THE RESULT OF BAD CIRCULATION IN MOST STEAM RADIATORS.



The above cuts represent the sectional and outside views of
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which has a positive circulation
HEATS UP AT ONCE,
the air being immediately expelled on the admission of steam.

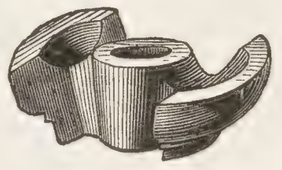
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Reverse Motion, Paneling, Variety Moulding and Dovetailing Machine, cuts Panels of any design or style of Mould in the solid wood, with neatness and dispatch. Is a first-class Shaper, Edge and Scroll Moulder. Does general Dovetailing with thick or thin stuff.

Simple, Durable, and Efficient.



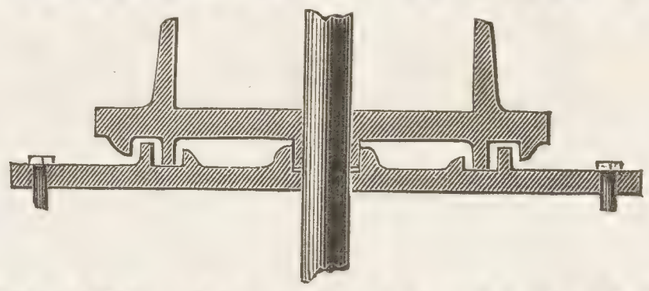
☞ Send for Pamphlet and sample of work.

Improved Solid Steel Cutters for all kinds of Variety Moulders made to order, and warranted by the

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CENTER OR TRANSOM PLATE

FOR RAILWAY CARS,

With Oil Receptacle for Bearing-Ring to work in. They are acknowledged to be the best in use. See description and drawings in CAR-BUILDER for January, 1874.

Address, AMBROSE WARD,
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CANTON STEEL WORKS,

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Machinery, Spring,

TIRE AND TOOL

CAST-STEEL,

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With Disston's Saws.

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Trade Mark, Registered May, 1874.

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PROPRIETORS AND MANUFACTURERS OF THE

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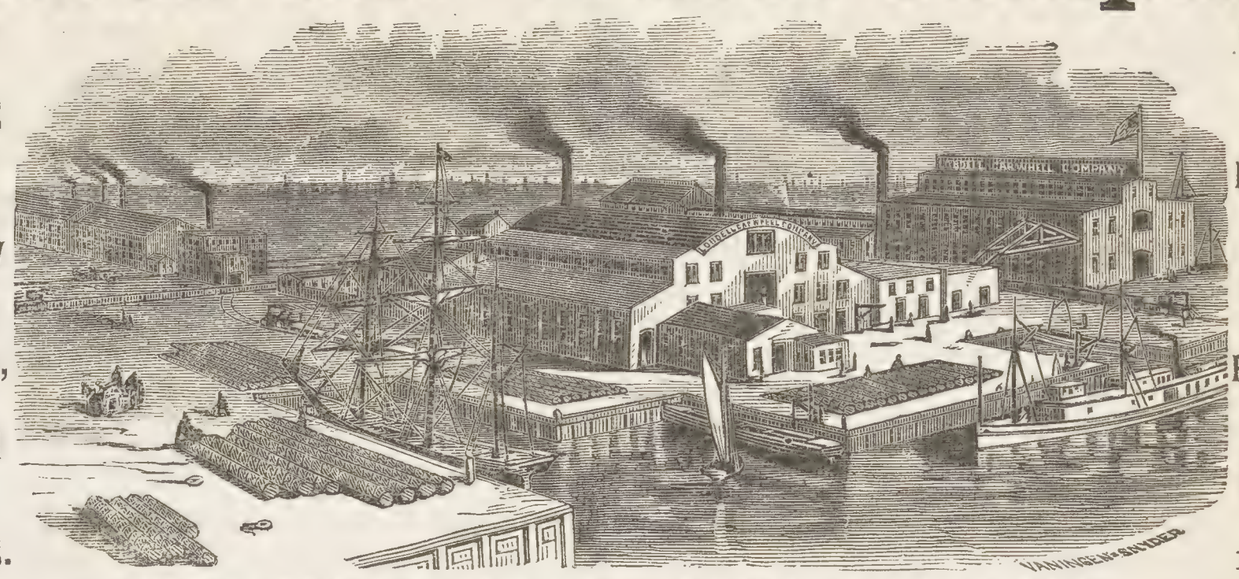
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Having perfected and patented our machinery, we guarantee all Moss put up by us to possess the following qualities—*full length of fibre, freedom from dust, strictness of grade, preservation of elasticity, and exactness of weight,* and used with great success by the leading carriage makers, upholsterers and railroad companies in the United States, as the most economical substitute for curled hair.

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SINGLE AND DOUBLE PLATE AND HOLLOW SPOKE WHEELS, FOR City and STEAM ROADS.



CHILLED ROLLS FOR PAPER, BRASS, COPPER, AND ROLLING MILLS. Castings of all Descriptions.

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Stimson & Babcock,

VARNISH MAKERS,

Boston, Mass.

RAILWAY CAR VARNISH.

Elastic, pale, and extremely durable, possessing great brilliancy of lustre, and producing a hard, fine **finish,** resisting in the highest degree effects of time and exposure. Should be used over our Rubbing.

RAILWAY RUBBING VARNISH.

Hard-drying, works freely on large panels, will not sweat out, and is very desirable where a fine and durable surface is requisite on which to finish.

LOCOMOTIVE VARNISH.

Dries readily, with brilliant lustre; durable under severest exposure in any climate.

INSIDE CAR VARNISH.

A hard-drying Varnish for inside work; is very light-colored, flows well, and dries in about 12 hours.

JAPAN GOLD SIZE.

Very pale, and preferable to Japan as a drier for delicate colors.

COACH PAINTERS' JAPAN.

A Superior Drier.

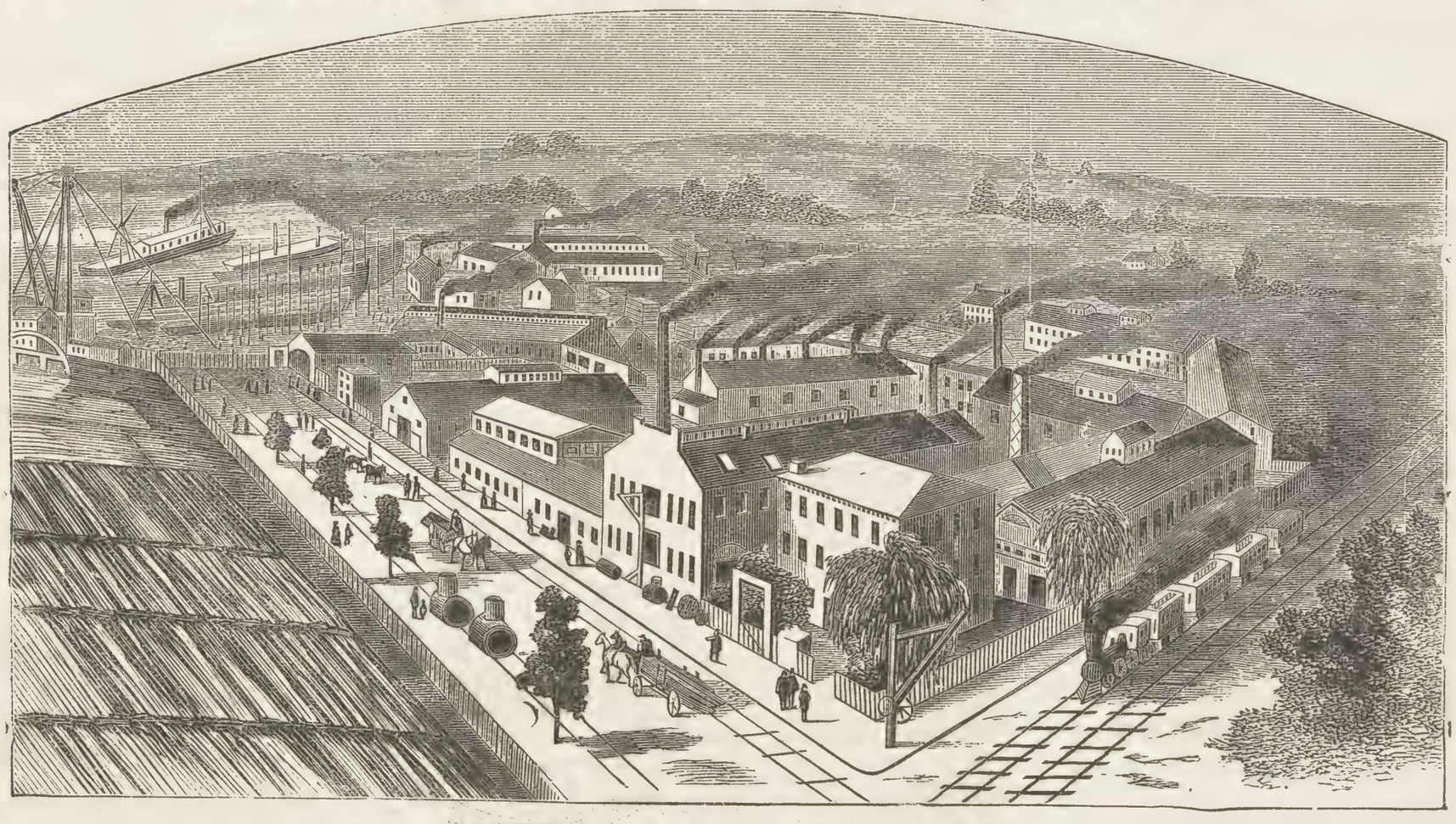
These **VARNISHES** are made with the greatest care and skill, from the best grade of stock, and designed especially for

RAILWAY CAR AND LOCOMOTIVE WORK.

They dry hard, and resist effectually the severest exposure to action of **Cinders, Smoke, or Climate,** having been tested for many years by the leading Railroads of this Country and have proved, for **brilliancy** and **durability,** fully equal to any of either Home or Foreign Manufacture.

THE HARLAN & HOLLINGSWORTH CO.,

WILMINGTON, DELAWARE,



BUILD ALL KINDS OF

RAILROAD CARS:

FIRST and SECOND-CLASS DRAWING-ROOM, SLEEPING, BAGGAGE, MAIL, and EXPRESS, BOX, and FLAT.

MURPHY & CO., NEWARK, N. J.,
MURPHY, SHERWIN & CO. CLEVELAND,
Varnish Makers.

We call attention to the following prices of our Varnishes especially adapted to Railway Uses, and submit that they combine more prominently than any others, the INDISPENSABLE REQUISITES for Railway Consumption. They are of heavy body, light color, quick drying, and are guaranteed to give a maximum of durability.

Wearing Body, (For Outside Finishing.)	**$5 50**
Hard-Drying Body, (For Under Coats on Cars.)	**5 00**
Rubbing Body, (For Under Coats on Cars.)	**4 50**
Inside Car, (For Interiors of Cars.)	**4 50**
Engine Finishing, (For Last Coats.)	**5 00**
Engine Rubbing, (For Under Coats.)	**4 50**
Japan Gold Size, (For Binding and Hardening Colors.)	**3 50**
C. M. Japan, (For Drying and Binding Paints.)	**2 00**
Black Enamel, (For Smoke Stacks of Engines.)	**3 00**
No. 1 Black, (For Iron-Work.)	**1 50**

UNIFORM SUPERIORITY IN QUALITY AND FIXED PRICE TO ALL will continue to characterize these goods, and Satisfaction in their use is assured.

THE DISNEY CAR COUPLER,

Patented June 24th, 1874. Manufactured by

F. E. CANDA & CO.,

CHICAGO, ILL.

Fig. 1.

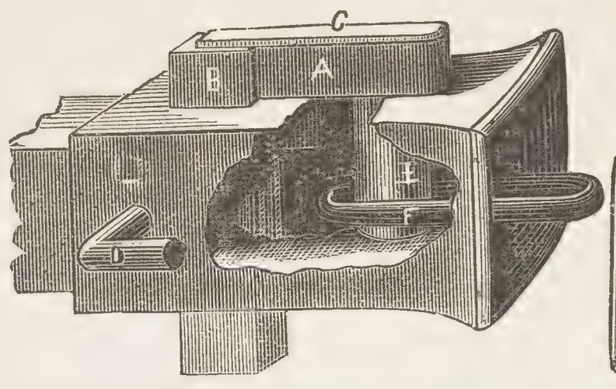


Fig. 2.

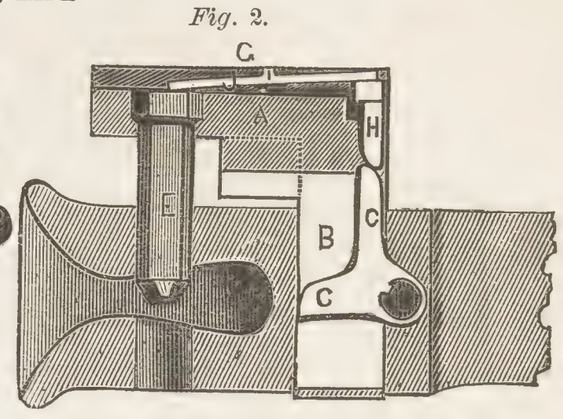


Fig. 1 represents the draw-head with a portion broken away to show the interior.

Fig. 2 represents a vertical, sectional view. *A B* we designate *The Drop*, the upper part *A* serving as the pin-holder. *D* is a lever by which the device is operated, fastened to a shaft passing through the draw-head. *C C* is a forked piece keyed to this shaft. *H* is a small loose pin. *E* is the large pin for securing the link *F*. *J* is a lever resting on the heads of pins *E* and *H*, with its fulcrum on cap-piece *G*. *Then*, when set for coupling or uncoupling, as in Fig. 2, the link *F*, in passing the mouth of the draw-head, raises pin *E*, which by lever *J* forces pin *H* against and displaces the upper arm of *C C*, allowing the *drop* to fall, carrying pin *E* with it.

From the above cuts and description it is apparent that this device combines simplicity in its construction, reliability in its working, and durability in all its parts.

We designate as points of special advantage:

That working from the side of the draw-head, it leaves no opening at the top for dirt, gravel, or accumulations of ice and snow to interfere with the working of the coupler.

That, while the link is always held in a horizontal position for entering, yet it has sufficient vertical movement to accommodate itself to cars of different heights, not exceeding a variation of six inches, without using the crooked link.

That the mouth of the draw-head is of such shape as secures the pin from all liability of bending or breaking.

That it always couples when desired, or set for coupling, and will *never* couple when not desired.

That, working readily from the top and sides of cars, there is no risk of life or limb.

That the pin can never be lost or stolen.

And further, that from its reliability of working, and durability of parts, combined with the device for securing it to passenger cars, makes *This Coupler* the safest and by far the most economical *Passenger Car* Coupler ever introduced.

The Disney Car Coupler, wherever tried or however thoroughly tried, has given the most perfect satisfaction, both as a Freight and Passenger Car Coupler.

For further information, address

H. C. KIBBE, 419 California St., San Francisco, Cal.,

AND

F. E. CANDA & CO., Railroad Contractors and Car Builders,

79 SOUTH CLARK ST., CHICAGO, ILL.

REFERENCE: RAILROAD CO.S' BUILDINGS IN *ALL* PARTS OF THE U. S.

Owners of large Buildings within 100 miles of our offices can obtain *Personal* services of one of our Roof Superintendents, who will furnish *full* information regarding best, *cheapest*, and most *effectual* way to Repair Old Roofs, or Lay *New* Ones, thus securing careful estimates from practical men. Correspondence invited.

GLINES' RUBBER ROOFING,

Largely in use on Rolling Mills, Factories, Foundries, Shops, Barns, Sheds and Private Houses throughout the United States.

Over 40,000,000 feet now in use! COMPLETE Materials for a NEW Roof, only 4½ Cents per foot!!

Can be laid by ***any*** one, and is superior to ***all*** other roofings for ***cheapness, fire-proof*** qualities and ***durability. Samples, also 100-page Book Free. Full*** particulars how to repair ***old*** roofs, ***save*** reshingling, ***prevent*** decay, and ***stop leaks effectually and cheaply,*** in roofs of all kinds, mailed ***any*** one stating where they saw this notice; write or call ***at once.*** Glines' Rubber Roofing being very elastic and requiring ***no*** tar or gravel, is strongly recommended by Architects, Corporations, Public Institutions, Builders, and leading men in all sections, for ***new*** steep ***or*** flat roofs. Can also be laid over ***old*** shingles, felt, plastic and mastic roofs with positive satisfaction; will not draw and split apart or crack; is clean to handle; pliable in ***cold*** weather; has ***on*** smell in hot weather; sheds water readily. Correspondence ***invited.*** Agent wanted in every town, and liberal inducements offered.

NEW-YORK SLATE ROOFING CO., 8 Cedar St., New-York, or 49 South Front St., Philadelphia.

JOHN T. LEWIS & BROS. WARRANTED PURE WHITE LEAD. PHILADA.

TRADE MARK.

JOHN T. LEWIS & BROS.,

No. 231 South Front Street,

PHILADELPHIA,

MANUFACTURERS OF

White Lead, Red Lead,

LITHARGE,

ORANGE MINERAL,

LINSEED OIL,

AND PAINTERS' COLORS.

JOHN JEWETT & SONS,

JEWETT & SONS PERFECTLY PURE WHITE LEAD TRADE MARK

182 FRONT ST.,

New-York,

MANUFACTURERS OF

PERFECTLY

Pure

JEWETT'S PERFECTLY PURE LINSEED OIL RAW, BOILED & REFINED.

WHITE LEAD AND LINSEED OIL.

THE NATIONAL CAR BUILDER.

DEVOTED TO THE INTERESTS OF RAILWAY ROLLING STOCK.

Vol. VI. *No. 11.* NOVEMBER, 1875. *$1.10 per Annum. Single Copies, 10 Cents.*

Railway Car Painting.

THE following address was delivered by M. W. Stines, Esq., President of the Master Car-Painters' Association, at its sixth annual convention held at the Grand Central Hotel, in New-York, on the 8th of Sept. last:

Gentlemen of the Master Car-Painters' Association:

Another year has passed away, and we have met in convention for the sixth time, to counsel with each other, and to give and to receive such information as, I hope, will prove beneficial to us in the future. The usefulness of such conventions is now recognized by all trades and professions; and, apart from the information we receive, they also serve as an occasion of a reunion which recalls to our minds the pleasant recollections and opportunities given us of becoming acquainted with each other, which I hope has proved beneficial alike to all. We do not come here to-day for the purpose of revolutionizing this question of painting, or to establish the superiority of any one method; neither do we expect to arrive at conclusions that will settle the question to our own satisfaction for any great length of time. We are constantly changing, and I mean by changing we are *progressing*, and continually supplanting old methods and theories with other and better ones. We must not be disappointed if we fail to accomplish at our annual meetings all we desire. I think we have accomplished much, and from listening to and participating in reports and discussions made at these meetings, we are better qualified to form opinions of materials, and the best methods of applying them. They have revived amongst painters an interest in their business, which, if continued, will lead to grand results.

Early in the fall of 1870, a call was issued to master-painters by a few members of the craft in and around Boston, to meet in convention for consultation as to the best means of advancing the craft, and advise some means to put a stop to the fraud practiced upon them for a number of years previous, in the adulteration of nearly every article of stock consumed in the paint-shop.

At that meeting, which was held at Preble Hall in Boston, on the 9th of November, this Association was organized, and for the purposes declared in the following resolution:

Resolved, That we, the Master Car-Painters of the United States, have assembled here for the purpose of promoting the interests of the craft, by discussing the different methods now used in painting rolling-stock on railroads—knowing that, by a general discussion of the subject, we may all profit by the experience of others, and become more proficient in our craft and of increased service to the corporations employing us.

Moved, That a committee of three be appointed to ascertain the most practical method of detecting the adulteration in paints, and other materials used in painting railroad-cars.

The purposes declared in this resolution, expressed, perhaps, not so strongly as they might be, are practical, and should not be lost sight of by the Association, if we hope to progress in our labors, and continue our organization with any hopes of success.

That car-painting has progressed rapidly in the last ten years is evident, and that this Association has been an active agent in its progress no one can doubt, and there is cause to congratulate painters on the proficiency attained in their work.

The smooth and expensive surfaces of a few years ago have to a great extent been abandoned, and we now find it practical to expend less labor *outside*, and more *inside*, where the traveling public have a better opportunity to see and appreciate it. The flat style of ornamentation, so peculiarly and perfectly adapted to car-work, has come into general use, and has been perfected to such a degree that our painted linings and other decorations are often the subject of artistic commendation, and destined, I think, to become important instructors in the art education of the people. The large number of palace-cars, and the better grade of work on other cars, have given us an opportunity to display our taste in color and ornamentation, which, I think, has not been thrown away.

The agency of the Association in influencing the production of good stock can not be doubted, and it is some gratification to know that the expression of this Association has had sufficient weight to influence the production of better stock by leading manufacturers; but some is still found that is worthless and not fit for use. We have all come to the conclusion that poor paint stock will destroy the reputation of the man using it, and prove a loss to the purchaser. We have all seen the results of using such stock, and I can not see why such material is tolerated in the paint-shop at all. The best you can buy is none too good, and will not always prove satisfactory. Our best varnishes will work better and wear longer if kept a year in the shop before using. As long as heat is employed to increase the product of linseed, and acetic acid to corrode lead, neither being thoroughly washed out, but ground together and put on the market in an unslacked state, we must expect to sometimes fail in the result of our labors. Allow me to call your attention to the importance of your position. Some of the railroad corporations of this country expend over $100,000 annually in their paint-shops, and much depends on the abilities of the painter whether the expenditure will be $10,000 more or less. We may assume that we have been put in charge of our departments because we understand our business better than other men. Many of us have spent twenty years or more in the paint-shop, and being possessed of ordinary intelligence, we have no doubt benefited by the many and various experiences we have passed through; experiences which I think justly entitle us to the consideration and recognition of railroad corporations.

There is no mechanical department of a railroad that requires more skill and attention than the paint-shop. It can not be controlled and successfully operated wholly by mechanical appliances or mathematical demonstrations; but a painter must understand many things to be able to overcome successfully the vexatious occurrences which so often take place. True, we are most of us occupying only subordinate positions, and can not always act according to our best judgment on matters of stock or its application. All departments of mechanics require the best stock to produce the best work. Good enough work is done with good enough stock, and if the powers that are require it, we must simply do the best we can with the stock at hand. To be able to understand this paint question thoroughly, and elucidate its principles, we ought to possess a knowledge of the sciences, which, I fear, few if any of us possess. But then again, if we were adepts in the science of chemistry, it is not likely that we would remain any great length of time in the paint-shop for three or four dollars a day, for quite likely we would then seek more remunerative positions, and thus deprive the car-shop of the services of some of the cleverest painters of to-day.

The skill, foresight, and strict supervision of the painter are sometimes of no avail, and painters who you would say understood their business, and who are usually successful in producing durable work, will sometimes fail. In a short time, a job is badly cracked, blistered, or otherwise disfigured, and you feel ashamed to own up that you have done your best on it. The causes are so slight that you are unable to account for them, and the experience you have gained by years of careful study in the paint-shop seems to be swept away in an instant, and we feel that there is yet much to learn before we become perfect painters. But we are not wholly to blame; manufacturers of poor paint stock ought to, and I think are willing to share it with us, for, in my opinion there is more work spoiled by the use of unripe materials than there is by poor workmanship.

No man is justified in remaining silent, and continue to use poor stock; if his arguments are not sufficiently strong to influence the purchase of good stock, they will tend at least to diminish its product, and encourage the manufacture of good honest materials.

Gentlemen of the Convention, you are, so far as I can learn, doing good work, and the style and durability of your work will average higher to-day than at any other time in the past twenty years; but much as has been accomplished in the manufacture and application of paints, I sometimes think that there is yet something wanting.

The substances used in painting are only capable of resisting the action of the elements for a short time, and there is no preparation that I know of that I can apply, and say with certainty how long it will last, or in what condition it will be found at the end of six months, and I look for the discovery of other substances whose permanence in color and durability will far excel the treacherous compounds now in use.

In the last few years, we have had an opportunity to test one or all of the numerous compounds gotten up to perfect and cheapen the labor of the paint-shop.

How many are now in use I can not tell; I know of none; all failed, and we are to-day where we were years ago, depending upon lead, oil, turpentine, japan, and varnish, as a basis of all our work. The total production of each of these articles is immense, and it is not to be wondered at if we sometimes get hold of a quantity of one or the other of them that is not good, but why it is not good we may not be able to determine. It perhaps does not work as well or do as good work as other lots from the same makers have done.

We ought all to be able to analyze our stock before using it. It would give us an advantage that we do not now fully possess, and would add to our success as painters. This question is deserving of our attention during the coming year; and when we meet again, I hope that each one of us will be able to say that our New-York meeting gave him a desire to study more attentively this question of painting.

If we do, the benefits of our continuous and united efforts can not be doubted.

Railway-Sleepers Abroad.

THE following remarks on the use of railway sleepers in Australia and Central America, are taken from a paper recently read by Mr. G. W. Ferrar before the English Society of Engineers:

"Sleepers present a difficulty always met with abroad, where the white ant causes such destruction with timber of all sorts. In Australia the author used sawn and half-round sleepers of red gum. These were excellent in every respect; they cost 5s. each, and were very durable. Sawn sleepers are preferable to the half-round, in consequence of the sap-wood. It has been found that a half-round sleeper from a small tree would last better than a sleeper cut from a large bough.

"In Central America the author used various sorts of timber—mahogany, lignum vitæ, laurel, pitch-pine, and other kinds. He found the laurel and pitch-pine stood the best, but in six months the permanent way required large renewals. In that country iron sleepers, though their first cost is greater, would have been much more economical. The influence of the moon on timber in tropical countries is not generally known, but the author can confirm, from his own experience, the fact. Timber, if cut during the moon's increase, invariably rotted within twelve months; whereas the same sort of timber cut after, or at the full moon, would last for several years. A species of palm called monaco (similar to a cabbage-tree palm), with which many of the houses are roofed, is an excellent example of this. During the moon's increase it is quite brittle; during its decrease it is quite tough. Another kind of timber is the water apuca, a sort of oliana, a piece of which, a foot long, if cut during the increase of the moon, will yield a pint or more of pure water; if cut with the moon decreasing, the same-sized piece will not yield more than a wine-glassful. This fact has been repeatedly proved. In tropical countries, where there was no winter, the sap rises and falls monthly, and, consequently, a tree contains more sap during the increase than it does during the decrease of the moon. No Central American will cut timber during the increase of the moon.

"With half-round sleepers the author once laid a mile of road with the round side in the ballast, and he found that the line stood better, and was far less trouble to pack at first, and to keep in order afterwards, than those laid with the flat side downwards. This is contrary to the general opinion. There is no doubt that the description of ballast has a great deal to do with sleepers lasting. It is questionable whether creosote pays its own cost; the creosoted telegraph poles in Central America do not last satisfactorily. It is considered a *sine quâ non* that for foreign work all pine timber should be creosoted, and no doubt some good is done; but creosoted sleepers go very fast in a hot ballast. The author has never had the opportunity of comparing them with the same species of timber uncreosoted, but hard-wood sleepers, such as red gum and laurel, are decidedly superior to the creosoted pine. He has used soft-wood pine, tarred over, for wall plates in open culverts, and has found them to last very well. Charring the portions in the ground is a great preservative for gate-posts and telegraph poles."

English Railway Carriages.

THE following is an extract from an article by Horace White, late editor of the Chicago Tribune, published in the Fortnightly Review:

"English railways come in for a large share of attention and comment from every American visitor. In the way of comfort to the passenger they are inferior to the transatlantic railways, while the charges for travel are higher. English passenger trains, however, are run at a higher rate of speed than American, and the conditions of safety for an equal number of trains are certainly greater. The arrangements for crossing each other's tracks and the ordinary carriage roads at different grades remove a large percentage of liability to accident. But on the other hand, the frequency of trains on the same tracks appears to make traveling by rail about as hazardous in the one country as the other. The arrangements of English railways for receiving and delivering luggage, and relieving the traveler from anxiety respecting it, are inexcusably bad, while the system of carriage construction seems to be a deliberate provocation to outrages. These difficulties, I suppose, are to be attributed in part to British conservatism, and in part to the reluctance of railway directors to incur some slight additional expense. A recent case has naturally drawn out from the public press all the reasons that are supposed to justify a mode of travel which makes such outrages possible, and has elicited from a grand jury the startling suggestion that there ought to be some means of communication between the guard and the passengers. The reasons for making a train of railway carriages consist of a series of small prison vans seem to be two in number, namely: first, it has always been so; second, Englishmen are exclusive and like to have compartments to themselves. That it has always been so we may readily admit, since the modern railway compartment is only the old stage-coach mounted on rails, minus the post-boys. As to the exclusiveness, however, it appears that you do not obtain it except in cases where only a few passengers happen to be traveling, or where the guard is bribed to incommode others in order to accommodate you; and when it is obtained, it is at the risk of having your throat cut or an indecent assault committed upon your sister. When the magic number of eight happen to be traveling together, then and only then is it possible to obtain exclusiveness without bribery and without danger of personal violence, under a system commended for its advantages in the way of exclusiveness. Logically, then, the English railway carriage, with its positive discomforts and potential dangers, is contrived for parties of eight. If there are only seven in the party, the danger is ever present that somebody whose pedigree is unknown may be thrust in among them, whereas if there are nine, one of them is quite sure to get mixed up with a miscellaneous lot of two-legged unfeathered animals, unless he is so fortunate as to find a carriage occupied only by a burglar or a lunatic. I would mention that parties of eight find no difficulty in being as exclusive as they like in American railway carriages, where there is commonly room for fifty or sixty, where ventilation is much more perfect, where there is entire freedom of moving about and relieving the tedium of journeying, and where certain conveniences necessary for comfort and favorable to our health are always at hand. I happened to be in a railway carriage in Italy, not long since, which was adorned with a glass case firmly imbedded in the compartment close to the roof, to which was attached a printed notice, saying that in case of extreme danger the passenger was authorized to break the glass with his 'elbow,' and then to turn a key communicating with the guard by electricity, after which he should thrust his arm out of the window and agitate it till somebody came to his relief, but that if the danger was not sufficient to justify him, he would be prosecuted to the full extent of the law. This, I believe, is an English invention. I had read a description of it many years ago, but the ocular presentation of the thing was irresistibly funny. If this is the article to which a young lady looks for salvation in her hour of need, it is no wonder that she is discovered hanging bodily out of a train moving at the rate of thirty or forty miles an hour. In reply to the objection that if a cord were passed through the train, communicating with the guard or the engine-driver, nervous people would be continually pulling at it and stopping the train, I offer the experience of one who has traveled some hundreds of thousands of miles by rail in the United States, where the bell-cord is always present, and who has never seen it touched by any body except the conductor or some employee of the train.

"The reason why the rates of railway fare are higher in England than in America must be on account of the greater original cost of the roads, since they do not seem to be making extravagant profits on their share capital. Of course, if people have the luxury of riding thirty miles an hour through crowded cities on the summit of arches more magnificent than those of the old Roman aqueducts, they must pay something for it. The sensation is a novelty to all foreigners, and probably nothing gives one a more distinct impression of the high material civilization centered in London. The extraordinary and unequaled facilities enjoyed by London for intercommunication by means of her elevated and underground railways and her river steamers, constitute one of the factors whose conjunction appears to make it impossible for any other city to overtake her in population and importance. The other factors, as they appear to a superficial observer, are perhaps worth noting. The first is the geographical size, or rather smallness, of England, which renders it convenient for every Englishman of moderate income to have a house, or at all events a lodging, in town if he chooses. In respect of her ability thus to recruit herself with the abundant strength of a whole nation, I think London is peculiar. The territory of France is so wide that Paris can never be to her what London is to England. New York has too many rivals on our side of the water to hope to gain on London in the race, however large our population as a nation may become, and no other city in Christendom bids fair to compete with the three here named. The next potent element of supremacy possessed by London is her accumulated capital and financial gravity, which it would be superfluous to enlarge upon."

Wood Figures.

THE figure of wood depends more upon the particular mixings and directions of the fibers than upon any difference of color. If a tree was found formed of merely circular rings, like the section of an orange filled with layers of peel instead of pulp, the horizontal section would exhibit circles; the vertical, parallel straight lines; and the oblique section, parts of ovals; but few, if any, trees are to be found either exactly perpendicular or straight, and, therefore, although the three natural sections have a general disposition to the figures described, every little bend and twist in the tree disturbs the regularity of the fiber, and adds to the variety and ornamentation of the wood. A perpendicular cut through the heart of the tree is the hardest and most diversified, because in it occurs the most profuse mixture and density of the fiber, the first and the last in point of age being presented in the same plank; but the density and diversity lessen as the board is cut further away from the axis. Curls are formed by the confused filling in of the space be-

tween the forks of the branches. The beautiful figure thus induced causes a log, say of mahogany, to be valuable in proportion to the number of curls it contains. There is great competition at public auction for such logs, and prices which seem astonishingly large are sometimes given for a log known by judges to contain several fine curls. Occasionally some disappointment may be experienced when the log is opened, but not often. The curl generally shows itself on the outside, where it can be seen, and there is always the possibility of there being interior ones, as well, which do not show on the surface. Figure is also produced as follows: The germs of the primary branches are set at an early period of the growth of the parent stem, and thus give rise to knots. But many fail to penetrate to the exterior, and are covered over by the more vigorous deposition of the annual rings. Each branch is a miniature tree down to the smallest twig, and this process goes on in each individual branch just as in the trunk. These knots produce figure in the following manner: When the germ succeeds in forcing its way to the surface, the future rings of the trunk bend and turn aside when they encounter the knot, and in the softer woods do not unite with it. This accounts for whitewood knots being so liable to fall out. The turpentine in other sorts of wood acts as a sort of cement and keeps the knot in its place. The hardness of knots is due to the close grouping of the fibers and to their compression by the surrounding wood, which itself is allowed expansion by the yielding nature of the bark.

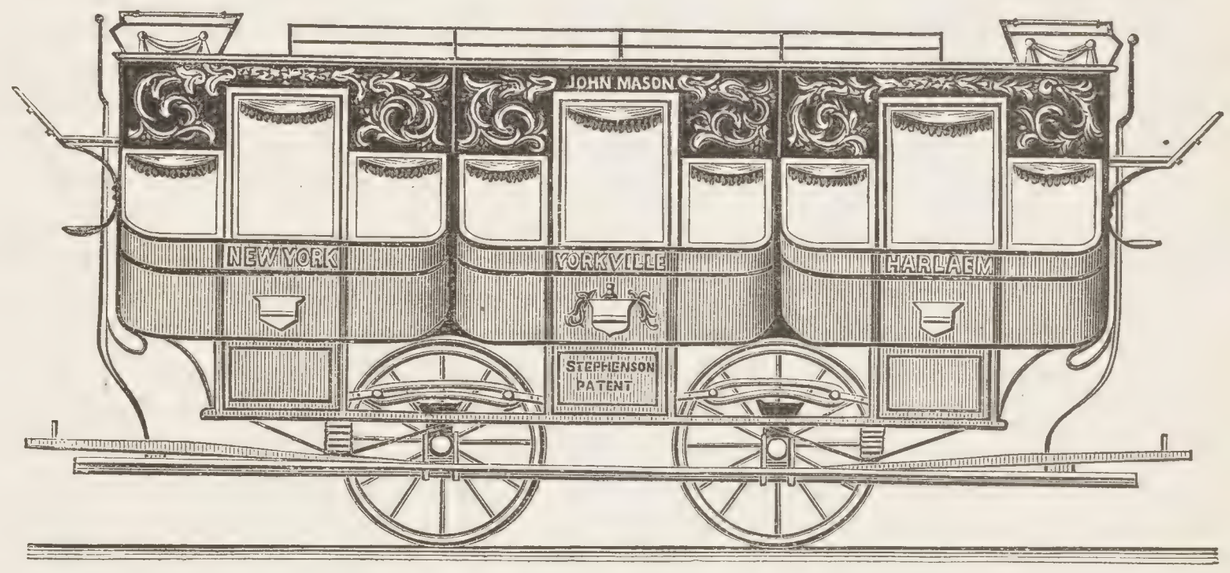
The Valve-Regulator as a Brake.

A WRITER in *Herapath* says: "The 'Valve-Regulator,' invented by Mr. Huntley some years ago, has proved to be the best contrivance yet discovered for stopping a locomotive. It consists of a circular sheave acted upon by the straps of the eccentric, regulating the lead as well as the travel of the slide-valves at the pleasure of the engine-man. In a single moment he can cause the full force of the steam to act as a holding power, resisting the onward progress of his train, without reversing the engine—the piston forcing the steam back into the boiler to 85 per cent of the stroke, when compression takes place up to 95 per cent of the stroke, then exhausting as regularly as if the engine were propelling, and continuing to do so until the wheels are held, which can be done if approaching danger in three or four strokes of the engine, little or no jerk being felt, as the piston acts against the steam as a spring buffer. From the way the steam can be applied, it is quite evident that the retarding power is greater than the tractive power, so that whatever load an engine could take up an incline, it could take a heavier one down. The steam can be employed to suit any gradient the engine may ascend, and the desired speed of the engine lubricating the cylinders in the same way as when propelling. When the engine begins to slip on the rails, the slide-valves can be so adjusted by the 'Valve Regulator' as to admit the whole pressure of the steam into the cylinders at the commencement of the stroke, thus making the motion more equal and the wheels less liable to slip. When approaching a station or stopping-place, the slide-valves can be adjusted to act as a shut-off valve, thus preventing the ingress of air or any deleterious matter into the cylinders through the exhaust ports. The engine-man can stop the train at the proper place by employing the steam either to propel or retard as the case demands. Although the 'Valve-Regulator' has been extensively applied to steamboats, I can not understand why it is not universally used on locomotive engines, when it can be so easily applied, and the cost so trifling."

THE directors of the Canada Southern Railway have decided to complete the road as far as Butler, Indiana, this season. The grading and bridging of these thirty-eight miles are already done.

The Street-Car Manufactory of John Stephenson & Co., New-York.

THE system of street railways which is now being adopted so extensively in every part of the civilized world, is essentially an American institution, and had its origin in the city of New York upwards of forty years ago. It was the natural counterpart of steam roads, and like them did not at first grow very rapidly in public favor. Its later and more active stage of development began in 1852, when the "gridironing" process was fairly inaugurated in this city to meet the demands of its increasing population and business. The construction of cars for this immense traffic has kept pace with its requirements, and now constitutes a most important branch of mechanical industry, which is not likely to suffer any material curtailment by the adoption of steam as a motor on our leading thoroughfares, in place of horses.



Original Street-Car manufactured in 1831, by John Stephenson, New-York.

Mr. John Stephenson, of the firm of John Stephenson & Co., of this city, was the pioneer in the building of street-cars, and has been engaged in the business from its commencement until now. Nearly all the valuable improvements that have been made from time to time in their construction, have originated with him. The works of the firm are located in 27th Street near 4th Avenue, and are fitted up with all the necessary facilities for turning out cars with the utmost dispatch and completeness. The force employed varies from 200 to 300 men, the details of the work being so classified and distributed that the greatest perfection is secured for each particular part, whether the material is wood or metal. These various parts which go to make up a car of the standard style or pattern, are many of them prepared in advance of orders, and by bringing them together, the vehicle is ready for the paint shop in two or three days. The lumber used is mainly oak, whitewood, white bass, ash and black walnut, all of which is thoroughly seasoned before being used. The firm is now actively engaged in filling orders from various parts of the country, and also from Europe and South America. These cars are of various styles of construction, those for home use consisting of two general classes, one for two horses, and the other for one, while those for foreign countries are many of them designed for carrying passengers on the roof or deck. This feature is quite popular abroad, but is not regarded with favor on our home roads.

As an illustration of the very great changes and improvements that have been made in the style of street cars since their first introduction, or rather since the first experiment was made in building them, we give a drawing or side-elevation of the first one built by Mr. Stephenson 44 years ago, and named the "John Mason." It was used on the New York and Harlem Railroad, and drawn by horses. As shown in the cut, the body is divided into three compartments with side-doors to each, the seats running crosswise and the passengers facing each other as in the old stage coaches. Each compartment seated ten persons, making thirty altogether inside. The seat of the driver is on top at each end, and there is also room for passengers and luggage on the outside. A long step-board runs along the side just below the wheel hubs, and the draw-heads are represented by the projecting pieces at each end. The wheels are 30 inches in diameter, and the body supported by means of leather tugs and thorough-braces. So far as appearance is concerned, this primitive structure is more elegant and graceful in its outlines than the street-cars now running, but far less convenient and available for the needs of city transit now-a-days. This car was designed and patented by Mr. Stephenson, the letters patent being a formidable looking document bearing the signatures of Andrew Jackson and Roger B. Taney.



Street-Car for North Metropolitan Railway, London.

We also present another engraving representing a style of car recently built for the London North Metropolitan Railway Company, and for which continuous orders are received. As will be seen, its leading peculiarity is the provision made for carrying deck passengers. The inside seats 22 persons, and

the same number can be seated on top. This, as it seems to us, would be apt to make the car top-heavy, but in practice we suppose this objection is obviated by much the greater number of passengers riding inside. The arrangement, however, has a heavy, clumsy look, and must occasion considerable delay and trouble in collecting fares and receiving and landing passengers. The weight of the car is about 5000 pounds.

As presenting a striking contrast in every respect as compared with this English pattern, we will briefly describe a style of car now being constructed at the above named works for a street railroad in Sacramento, Cal. These cars are intended to be drawn by one horse, experience having proved that where the traffic is not excessively heavy, this class of cars yield better returns, for the reason that more frequent trips can be made, and more of what is termed "short riding" is secured, making a difference of 20 per cent. in many cases, in favor of the receipts of one-horse cars as compared with their expenses. The cars to which we refer are 12 feet long exclusive of platforms, and seat 16 persons. The entrance is at the rear end, protected by a nickel-plated guard-rail; the driver acts as conductor, and can open or close the rear door by means of a lever door-operator. A mirror is placed in the outer edge of the hood in front of him, in which he can see the rear door and the movements in the car without turning his head. The fares are placed in a fare-box. Bell-cords run along over the heads of passengers on each side, so they can be reached without rising from the seats. The entire weight of body and running-gear is 2700 lbs. The construction is exceedingly light and elegant, the woods employed in the inside finish being principally ash and basswood. Ventilators are placed in the roof, and there are also sliding glass panels for the same purpose in the front door. To secure easy riding by preventing concussions from communicating directly from the rails to the car body, bits of rubber are interposed in the brake apparatus, and at other points where metal surfaces would otherwise come in contact. The advantages of this style of car are becoming more widely known and appreciated, and are not confined exclusively to the Pacific coast. It is doubtful whether, as regards utility in operation, by which is sought to be secured the largest proportion of receipts to expenditures, a better pattern of street-car for ordinary traffic is likely to be devised.

The cost of the cars built at these works ranges from $800 to $1200 each, according to style and capacity. A few omnibuses are also manufactured, but the number is constantly diminishing.

It is estimated that $100,000,000 in gold and silver is paid annually by this country as interest to foreign bondholders of national, state, city and railroad bonds; and at least $40,000,000 more is taken out of the country, every year, by tourists. Moreover, our exports of miscellaneous products come short of our imports by several millions, which balance must also be added to the enormous sum of $140,000,000 to meet our annual payments abroad. Were our gold and silver mines to cease producing for two or three years, we should become bankrupt as a nation; whereas, by a little more economy in our exports, or by a little more determined effort to produce at home that which we now buy abroad, the United States might soon become the richest and most prosperous nation on the globe. These facts are repeated year after year by the public prints; but the thriftless work of monetary depletion still goes on. The gold and silver mines of the Pacific coast seem to be the only medium by which the catastrophe of national bankruptcy can be warded off. The nation can well afford to hold them free to all comers, and in every way to encourage their being worked to their utmost capacity.

Steel vs. Iron for Car Axles.

BY J. M. BLANCHARD.

The *Journal of the Franklin Institute* for August 1875, contains an article* entitled "Steel in Engineering Practice," in which the writer alludes to some experiments made during the session of the Railway Master Mechanics' Association, in New York, in May last, and designed to show the comparative strength of steel and wrought iron car axles. The writer says:

> "These experiments consisted in letting fall a drop weight of 1600 lbs. from heights of 25 and 35 feet upon the bars of iron and steel which rested on rigid supports placed 3 feet apart, the blow being delivered midway between the supports."

Following this is a somewhat detailed account of the results of such experiments, which it is not necessary to quote, in view of the apparent object which underlies it. Further on the writer says:

> "It has been our intention to comment on these experiments, but we delayed doing so to obtain some definite information from prominent railroads as to the success of the steel axles in actual use. While engaged in this inquiry, we are met by an article in one of our exchanges, a widely circulated paper, devoted to the iron interest. The article is headed "Steel Railway Axles."

Then follows an extract from the article alluded to,† in which the writer says:

> "If tests by means of weights subjected an axle to strains in any respect similar to those it encounters in actual service, the results might be considered conclusive; but they do not; consequently they are practically valueless as determining whether steel is, or is not, a better material than iron for this use."

The statement embodied in this extract contains so much truth that it is entitled to the careful consideration of railroad men. The tests referred to would seem to be quite as apt to mislead the experimenters as to establish any correct principle, for the reason that stiffness or ability to resist shocks, is only one of the qualities required in a railway axle. The experience of railroad men in this and other countries, has already been sufficient to demonstrate that so far as mere stiffness and strength are concerned, the iron axles in use possess these qualities to the full extent that is required. It is obvious that many other qualities besides these are requisite in a good axle, and that among them is its ability to resist the deteriorating effects of vibration and the jars caused by imperfect rail-joints; the wear of journals also is an important consideration, and especially their capacity for proper lubrication. The question of stiffness alone has little to do in the forming of a correct judgment in the matter, except so far as it relates to a reduction of weight. Many years of experience have proved that iron is stiff enough for all practical purposes; for it is evident that if journals did not wear away, and the axles throughout their entire length did not become brittle and more liable to be broken by rotation, jars and strains, they would last for an indefinite time. It is manifest that the best material is that which possesses inherently the greatest ability to resist the wear upon the journals and the tendency to molecular crystallization, provided there is no other element outside of and distinct from these.

Let us now consider the jars or blows to which axles are subjected when in use. These jars are really the effect of blows, as much as if they were caused by a hammer in the hands of a man, the only difference being that in the former case they are delivered through a somewhat elastic material, while in the latter the elasticity would be wanting; hence the effect in the practical running of axles would be somewhat modified. Now if we suppose that two bars of metal of equal diameter, one of steel and the other of iron, are placed upon supports equal in solidity to two wheels resting upon a railway track, and subjected to a succession of light blows such as could be given by a man with a hammer made of such material as not to cause indentation, it would seem to follow that the steel bar would be less affected thereby than the iron bar, for the reason that there would be less movement of the molecules of the former than of the latter, because, as we should say, the steel was stiffer than the iron. The steel bar would in this case have the advantage, and hence it follows that an axle of that material is better adapted to resist deterioration from blows received when in actual use.

The writer last above referred to, in support of his objections to the practicability of steel as a material for axles, again says:

> "Steel axles have been placed under cars on several different railroads by gentlemen with whom we are acquainted, and in each case they were abandoned on account of their liability to heat. We know this as a fact, although we do not know the reason for it."

This is an important statement, and if it is true, will have great influence in determining the question at issue. But is it true that a steel axle, under the same conditions, is more liable to heat than an iron one? The majority of people will most likely answer in the negative, alleging that steel is a harder substance than iron, is less liable to be seamed or to have an imperfect surface, and will take a higher polish; all of which is true, but these facts do not prove that steel axles are not more liable to heat. In order to reach a correct conclusion in the matter, the structure of the two materials must be carefully considered. The microscope shows the steel to consist of an almost infinite number of molecules, which are neither cells nor spheres, but are of irregular and varying forms, and crystalline in character. They are very small, and the spaces between or among them are correspondingly so. The iron axle is also composed of molecules of similar character, but larger, and hence the spaces between them are also larger. This enables us to understand why the journal of the steel axle is capable of receiving a higher polish, and of being made smoother than an iron one. The cavities in its surface are not as deep. The composition bearings which rest upon the journals have a very smooth surface, and if properly fitted, the contact of the two is very close, especially after the two have been worked or run for a time. The present method of lubricating is to bring the oil in contact with the under side of the journals by means of cotton waste or other similar substance placed in the boxes. A film of oil is thus carried up and between the journal and bearing; but if the surfaces of both were *perfectly* smooth, how could the film of oil be carried to the top or remain between the respective surfaces? It manifestly could not be done, especially when it is remembered that the surfaces are pressed together by the force of several tons weight. The only reason then, why a journal is capable of being lubricated at all from its under side is, that its surface is not perfectly smooth. The cavities in the metal receive and carry the oil to every part of the surface, while the projecting protuberances support the weight. This accounts for the fact that steel journals, as alleged, are more liable to heat in running than iron ones. The axles of which they form a part are made of finer metal, the hardness and stiffness of which may add very much to their value in other respects.

It does not necessarily follow, however, that the use of steel as a material for axles must be abandoned on this account. The difficulty can in all probability be remedied by using oil of less specific gravity and greater fluidity, and which is capable of being pressed into smaller cavities than the heavier oils. Another remedy may be suggested, and that is the lengthening of the journals, or increasing both their length and diameter, so as to secure a greater bearing surface and making the contact less perfect by distributing the weight over a larger space. I do not apprehend that the introduction of steel axles will be made to depend upon this one point of liability to heat. There are other and far more important considerations to be attended to before a final judgment is rendered Economy in first cost will for a time be regarded as a vital element in the problem, but this will in all probability be superseded by the two really important points of *endurance and weight*, the first of which doubtless will take precedence in the minds of railroad men, and in settling this point they will incidentally dispose of the other; for it is reasonable to suppose

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* See October Car-Builder, page 145.

† See August Car-Builder, page 121.

that if a steel axle of a given diameter is found to be all that is desired with respect to endurance, the next step will be the trial of one of less diameter, and so on until the limit or minimum is reached without materially shortening the axle's life. In this way the real benefit would at last be obtained, and this in its final analysis, would be the saving accomplished in the cost of transportation.

Narrow-Gauge Passenger Cars.

In spite of the prejudice against narrow-gauge railroads, the system appears to be growing in popular favor. In their capacity as feeders to more important lines, and as affording an outlet for products in localities where population and traffic are not sufficient to warrant the construction of more expensive roads, they are likely to become a permanent and indispensable feature of our general system. This is evident from the large number already projected and in the course of construction, to say nothing of such as are being successfully operated. Their business is not likely to be limited altogether to the transportation of freight. Wherever productive industry exists, a passenger traffic is necessarily developed. A few years ago a narrow-gauge passenger car was looked upon as a kind of curiosity, interesting on account of its novelty, but not likely to be of much practical use in the long run. It did not coincide with the popular idea of luxurious traveling; it seemed to be an advance backwards, a temporary freak that would soon demonstrate its own absurdity. That these impressions were erroneous, and that the error is now undergoing the process of correction, is manifest from the numbers of such cars that are constantly being constructed, and the improvements that have been made in their design and adaptation to the special service for which they are intended.

The engravings illustrate some of the latest and most improved cars of this description, comprising four different styles recently built by the Ohio Falls Car Company, at Jeffersonville, Ind., for the several narrow-gauge roads whose names appear on the letter-boards. We give a description of each, made up from the specifications furnished us.

Fig. 1 is a first-class passenger car, elegantly finished inside and out in a style of superior workmanship and of the best materials. The body is 40 ft. long outside of end-sills, and 8 ft. wide outside of panels, contains 23 double reversible seats, and 4 stationary corner seats, thus affording seats for 54 persons. The outside has alternate wide and narrow panels below belt-rail, and elliptical arches over windows; also rich mosaic work in panels between windows and belt-rail, and an oval panel with the number of car in the center. The inside is finished in walnut and ash, with raised panels between and over windows, and gilt and ebony mouldings. The seats have walnut frames and are upholstered with crimson and green plush; the deck-lights are of richly cut colored glass pivoted and protected by wire gauze; the windows have double sashes, the upper one of figured ground glass, also double blinds. Weight of body 11,460 lbs., weight of trucks 5975 lbs., total weight 17,435 lbs.

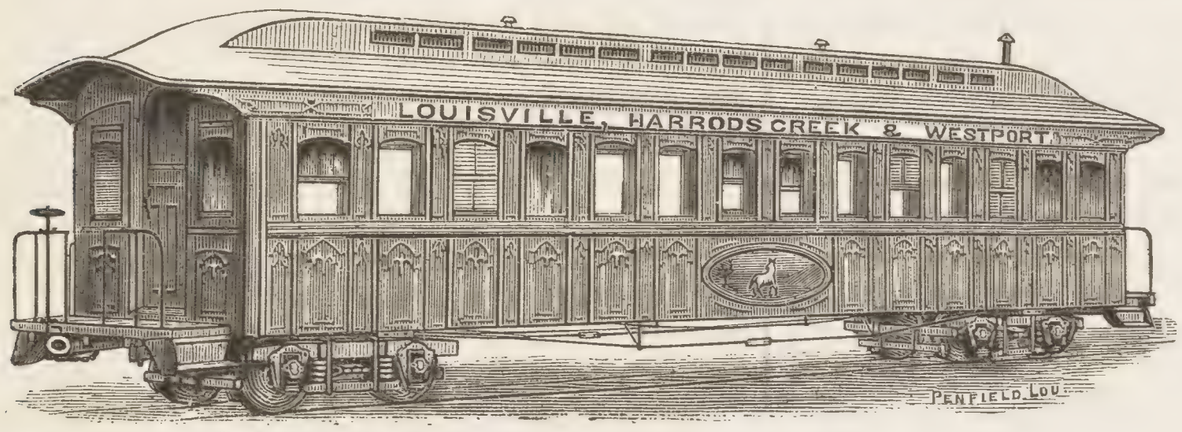


Fig. 1.

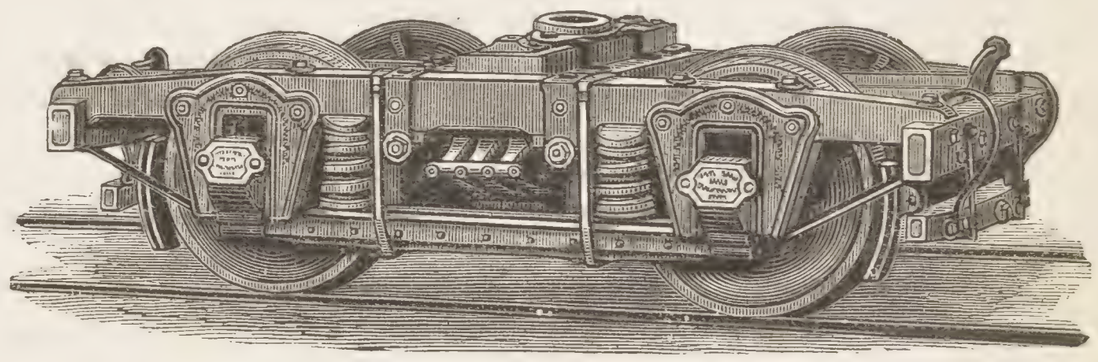


Fig. 5.

Fig. 2 is an excursion car built for the same road, and seats 64 passengers. The seats are reversible and made of ash and walnut slats, these being more suitable, and taking less room than upholstered seats. The windows and blinds drop down like those of a street car. Some other cars of this class have since been built by the company with a deck or raised roof, which greatly improves their appearance. The body dimensions are 40 by 8 feet over end-sills and side panels. Weight of body 7800 lbs., weight of trucks 5975 lbs., total weight 13,775 lbs. By packing, street-car fashion, this car has carried 125 passengers, which is reducing the proportion of dead weight to a minimum that ought to be satisfactory.

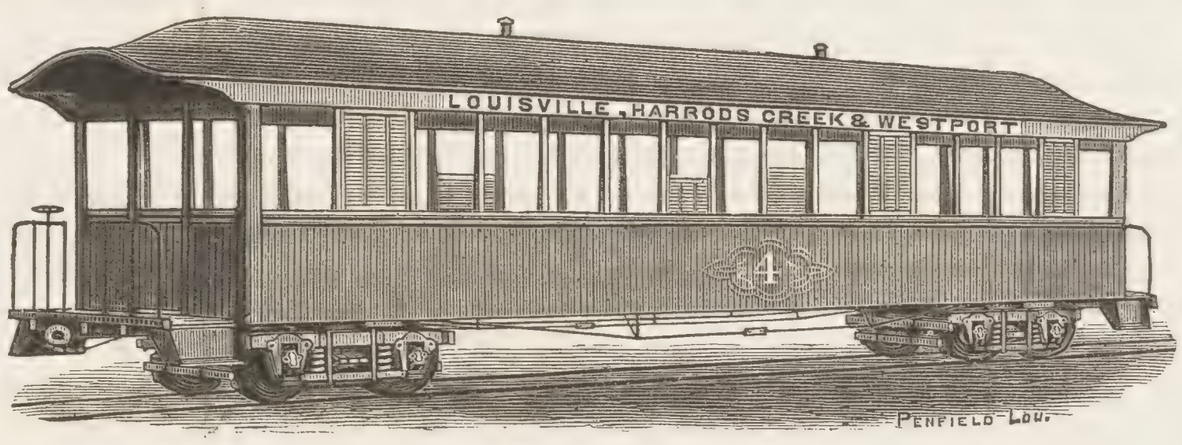


Fig. 2.

Fig. 3 is a first-class passenger car 29 ft. long by 8 ft. wide over all, and seating 38 persons. The finish, both inside and out, is the same as that of Fig. 1. Weight of body 8350 lbs., weight of trucks 5960 lbs., total weight 14,310 lbs.

Fig. 4 is a combination smoking and baggage car with slatted seats, and finished in soft woods, oak grained. Weight of body 7710 lbs., weight of trucks 5960 lbs., total weight 13,670 lbs. Dimensions 30 by 8 ft. over all, and seating 32 persons.



Fig. 3.

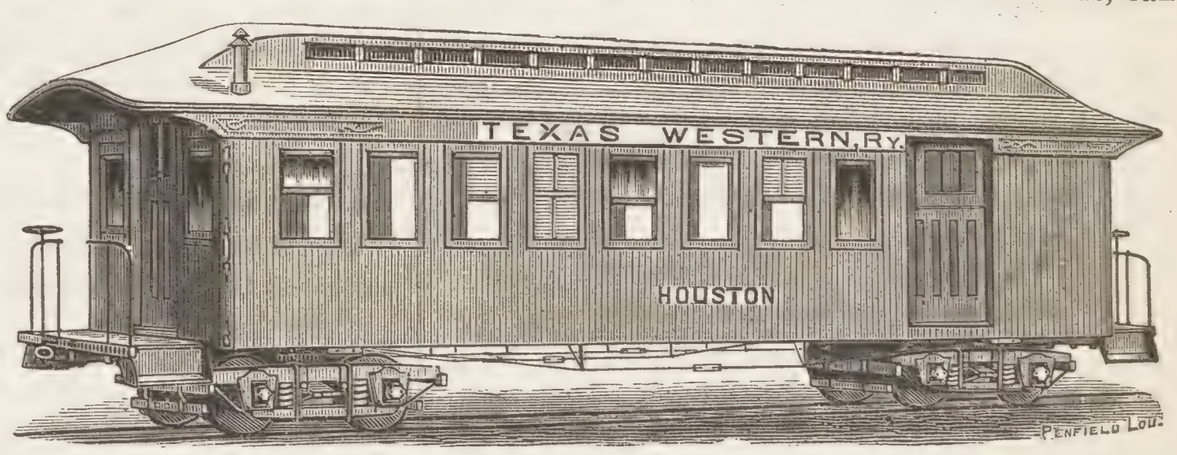


Fig. 4.

The style of truck used under all of these cars is shown on a somewhat larger scale in Fig. 5. Its average weight is less than 3000 lbs., yet it is compact and strong. It will be observed that the equalizers are attached to the under instead of the upper side of the oil-boxes. They are a new style, designed by the Ohio Falls Car Co., made of angle iron, and very light and strong. This method of applying them brings the car body very close to the track. Cliff Elliptic and Dinsmore springs are used, a combination

Wonderful Engineering.

Any one desiring to obtain any idea of the stupendous accomplishments of railroad engineering, should spend a few days in Tehachape Pass investigating the operations of the Southern Pacific Railroad Company. About twenty miles of that road is a succession of cuts, fills and tunnels. Within this distance there are thirteen tunnels, ranging from 1100 feet to a few yards in length. For the greater portion of the way the road-bed is cut through solid granite. The elevation is so great from the present terminus of the road, at Caliente to Tehachape Valley, that the first mile and a half out of Caliente is attained by laying down eight miles of track. Higher up in the pass the road runs through a tunnel, encircles the hill, and passes a few feet above the tunnel. After completely encircling the hill, and going half around again, the track doubles on itself like a closely pursued hare, and after running several miles in the opposite direction strikes up the canyon. Once the track crosses the pass, and this involves the building of a long and very high bridge. We doubt if a more difficult and expensive piece of engineering was encountered in the building of the Central Pacific over the Sierra than that with which the Southern Pacific is now struggling in Tehachape Pass. Another tremendous piece of work is the San Fernando tunnel, which, when completed, will be over a mile and a half in length, and in places over 1000 feet beneath the surface. Yet the company will accomplish this great work, and run cars through from San Francisco to Los Angeles by the first of next July. All the force that can be used is kept at work on the San Fernando tunnel. In the Tehachape Pass 5000 men are employed, and the force is being increased at the rate of 1000 Chinamen per week.—*Los Angeles* (*Cal.*) *Herald.*

Mr. Wm. E. Morris, one of the most celebrated civil engineers of Pennsylvania, died suddenly at his residence in Philadelphia on the 15th ult.

which can hardly fail to secure easy riding. The wheels are 24 inch, and gauge 3 feet.

It will be seen that the leading feature of this construction is its great carrying capacity in proportion to the dead weight. This has been the point aimed at in the design of these cars, and it is this important advantage which constitutes the chief merit of the narrow-gauge system. The Ohio Falls Car Company has done much in the course of its long experience to improve the quality of railway rolling-stock, and these cars exhibit an excellence of design and workmanship worthy of the reputation of the builders. While seeking to reduce the burden of dead weight to a minimum, they have been careful not to make such a use of material as to sacrifice any needed strength. The stiffness of the bodies is secured by wood and iron trusses, and by hog-chains under the center. Another feature of these cars we must not omit to mention, although it is implied in what we have already said. It consists of double seats on both sides of the aisle, instead of half single and double on each side. The Ohio Falls Car Company was the first to introduce this method in narrow-gauge cars, and other builders, we are told, have adopted it.

Semi-Centennial of Steam in England.

LATE foreign mails bring full details of the railway jubilee recently held in Darlington, England, where the semi-centennial of the introduction of steam locomotion was celebrated with great pomp and circumstance. On September 27th, 1825, Darlington witnessed the starting of the first railway passenger train expressly designed to compete with the existing modes of traveling. As the greatest of all difficulties in those days was to believe that people would trust themselves to the mercy of a moving steam-engine, or would have any need of that eccentric kind of traveling, the "first-class" on this occasion was the inside of an old stage coach put on a truck; the "second-class" was the outside of it, and the third-class the ordinary coal wagon. These, however, were pretty well filled, and as the train gathered speed the public gathered courage, and it is related that it entered the next town with as many as 600 in the wagons or clinging to them. The old coach with its new motive power had attained a speed of fifteen miles an hour. The whole load on that day was ninety tons, and the journey was done at an average rate of eight miles an hour. It was the glory of George Stephenson, not so much that he solved a mechanical problem, but rather that he saw his way, and steadily pursued it through a world of difficulties. The nine or ten miles opened on that day have grown to 16,500 miles in Great Britain alone, though only a small part of the world, and the $2000 received for passengers in the first twenty-one months have grown to $110,000,000 a year. Even figures, however, but feebly indicate the change wrought in the whole constitution of society by the iron horse and iron road.

Headwork the Aid to Handwork.

THE pursuit of mechanics involves accuracy of eye, knowledge of form and of proportion, strict measurements, and a due preservation of the relation of parts to each other, and of the whole to the several parts. It teaches also economy of material and of space. Strength and utility may, indeed, be acquired without observation of all these details. The old-fashioned iron and other metal work of houses, carriages, and agricultural and other implements, and the waste of wood and stone and brick and other materials, show that the workers for our grandparents consulted safety and durability without much regard to taste or elegance. The work in an old-fashioned chair would almost make a full set of modern ones. A Lancaster lock-handle was long enough to act as a lever to lift a hundred weight. Competition, making economy necessary and requiring elegance and fitness in order to secure purchasers, has changed the style both of houses and furniture. And a better comprehension of the strength of materials has caused modern machinery to attain what ancient machinery lacked, that is symmetry and even elegance as well as strength. If an iron worker of the last century had undertaken to construct a locomotive, for instance, it would have been a clumsy and ugly affair. Now the parts are proportioned exactly to the power required, and the details are worked up with an eye to beauty. A train of highly finished cars, drawn by a first-class locomotive, is a triumph of strength and beauty. The engine is as handsome and handy as it is mighty, and obeys the slightest touch of the engineer; while with improved brakes the whole swift-moving mass can be brought to a stand-still in a few yards.

It is a common mistake, the result of an old prejudice, to speak of mechanical work as a pursuit opposed to elegance. Every leaf on a stalk, and every branch on a tree, every part of a flower, is put in its place according to an order of arrangement that is the equivalent of mathematical and mechanical rule. The seed that lifts the earth-crust, and the tender shoot which, in its way to the light, moves with a power that displaces pavements and walls, do their work on mechanical principles. The great systems of stars and worlds obey physical laws. The human body, in health the perfection of beauty as well as of strength, in its structure illustrates nearly or quite all the mechanical forces, and in its functions is a perfect laboratory. The fine arts and the refinements in textile, and in all other manufactures, are only deductions from the axioms of fixed science. Jachin and Boaz, the pillars in Solomon's Temple, combined strength and elegance. The curve of the arch, supreme strength, is the line of beauty. The beautiful and the useful are nearly related; and civilization is largely indebted to their alliance. The intellect of man is as much improved by the use of the hands as by the use of the eyes.

If in one direction a man's mind is expanded and his taste elevated, the whole mind and the whole man are improved. The liberty of the aborigines of this continent (or to speak more correctly, the freedom which was enjoyed by the race encountered here by the colonists who founded this republic) had done nothing for their own improvement or elevation. The intruders upon their domain have, in less than three centuries, built up a nation which ranks among the first on earth. To the following of industrial pursuits we owe, more than to any other earthly influence, the prosperity we enjoy. The intellect which has, in devising political institutions and creating educational opportunities, given us a good government, was developed in the pursuit—the mechanical pursuit—of the arts of life. Agriculture shares the same good influence, for the culture of the ground is developed into a science.—*Phila. Ledger.*

A New Invention Relating to Steam Engines.

A NEW invention relating to steam engines is described in the *Trade Review* as below. The inventor is a Cleveland man:

"The invention consists of a new and simple mechanical movement, whereby the power of two cylinders is applied to the crank, in such a manner as to make it a lever of constant value, and the full power of both pistons is exerted in opposite directions on the crank wrist at the time the latter passes the center; this power is constantly transmitted in the direction in which the crank moves, and never, at any point of the revolution, is there any thrust toward the shaft. The following is an outline description of the main features of the invention. The rectilinear motion of the pistons is preserved by means of cross heads and guides, in the usual manner; connecting rods extend from these cross-heads to the opposite horizontal arms of a cross. The upper vertical arm of the cross is pivoted to one end of a vibrating beam, which is in turn pivoted, at the other end, to the frame of the engine; this allows a rectilinear, oscillating motion of the cross. The lower vertical arm of the cross is connected with the crank wrist. The valves of the cylinders are set to give to one piston an advance or lead over the other, by which means the one piston will have reached the end of its stroke and be ready for the return, before the other will have completed more than two thirds of its stroke; and the cross, acting as a lever of equal arms, receives the full power of both pistons from opposite directions, thereby forcing the crank wrist up to and beyond the line of centers; having accomplished this much of a complete revolution, both pistons now act upon the cross in the same direction, the cross moving bodily, until the crank wrist reaches a point forty-five degrees in advance of the line of centers, when the relative position of the stroke of the two pistons will be reversed from that stated above, and the same action is repeated to bring the maximum power of the two cylinders to bear upon the crank wrists, at the time it passes the line of centers. The avoidance of all shocks, by the uniform application of power, renders a great reduction of the strength of different parts possible, and great economy of space is gained by a material shortening of the connection. For a reverse and cut-off gear, there is a movable eccentric, which secures all the advantages possessed by the best arranged link motion, while, at the same time, there is no variation in the lead of the valve; this allows of operating the valves of both cylinders by one single eccentric."

An engine constructed on this plan is in use at the Cleveland *Herald* office, and it is claimed that it saves a large percentage of fuel. Another has been placed on a new tug at Cleveland now receiving its finishing touches.

A New Special Coach for the Erie Railway.

A NEW first-class passenger coach for the special use of the road directors and excursion parties, has just been completed at the shops of the Erie Railway, in Jersey City, under the supervision of Mr. J. B. Hill, the general foreman of the car department. In the design, finish and adaptation of the interior compartments to the convenience and comfort of occupants, it is worthy of the special attention of railroad men and car-builders. In the absence of drawings, a description is necessarily imperfect, and can only convey such a general idea as may induce those to inspect it who have the opportunity of doing so.

The body of the car is 56 feet long exclusive of platforms, and 9 ft. 6 in. wide from outside of panels. The exterior is painted a maroon color, with no special ornamental feature to distinguish it from the other passenger cars of the road. It is provided with Miller platforms and couplers, and runs upon 4-wheel trucks with adjustable axles, so arranged that the wheels can be brought nearer together to fit a narrower gauge when required. The platforms are enclosed with metallic railings, and one end of the car-body is rounded. The door at this end opens directly into a reception room 17 feet in length, and elegantly furnished with easy-chairs, lounges, center-table, etc. Next to this room, and occupying the central portion of the car, is a private sleeping apartment, with the bed so arranged that it can be raised to an upright position when not in use, and leave nothing to indicate its presence. In connection with this apartment is a toilet room, wardrobe and closet. There are also in this central part of the car a large water-tank supplied from the roof; also a side passage way, water closet, lavatory and Baker heater. From this passage way, which is widened at the end, a central door opens into the sleeping and dining room, which is 13 feet in length and of the entire width of the car. This is fitted with four upper berths and a corresponding number of bed sofas underneath, which are of course so transformed during the day as to give the compartment the appearance of a sitting room. It is furnished with an extension table for dining purposes, electric bell fixtures for communicating with the porter, an elegant

silver-plated chandelier, curtain rods, etc. From this room a door leads into the kitchen, which occupies the end of the car. It is furnished with a range, bureau for crockery, ice and coal boxes, pantry, china and linen closets, refrigerator, water-tank, and every requisite of completeness. The finish is in ash and black-walnut.

The rest of the car is finished throughout in black-walnut and bird's-eye maple, with red cedar mouldings, giving it an exceedingly rich and tasteful appearance. The floors are laid with Brussels tapestry, top ventilators are used, the windows have elliptical tops, and wire screens are provided to take the place of the lower sashes when necessary to keep out dust and cinders. The reception room, first alluded to, has a magnificent silver-plated chandelier. It has evidently been the aim of the builder to construct an elegant, attractive and beautiful coach, marred by no questionable devices for mere effect, in which every accessory and detail are subordinated to a useful purpose, and at the same time exhibiting skillful design and workmanship. As a car-builder, Mr. Hill has had a long experience, and any work he turns out is not likely to be marked by errors of judgment.

The Painesville and Youngstown Railroad.

THE relative economy of the narrow and ordinary gauges in the transportation of coal, is likely to be fairly tested in the course of another year by the active competition of three roads running from Youngstown, Ohio, to as many Lake ports, namely, Cleveland, Painesville and Ashtabula. The Painesville and Youngstown road, which has just been completed, has a three-foot gauge, is about 70 miles in length, and will have for competitors the Mahoning Valley, and the Ashtabula, Youngstown and Pittsburg roads, both of ordinary gauge. The chief business of all these roads is hauling coal. It is claimed as an advantage of the three-foot gauge, that a car weighing only 4 tons can carry 8 tons of coal, while on the wider gauges, a car weighing 10 tons can only carry an amount equal to its own weight, thus burdening the track and taxing the motive power with twice as much dead weight as the narrow-gauge cars. We have yet to see, however, how this theory works in practice; and should its correctness be demonstrated, with no incidental drawbacks, such as more frequent renewals of rolling-stock, and a greater comparative cost of operating the narrow-gauge, its utility for this kind of traffic will be established. One difficulty must attend its operation unless its track communicates directly with the mines and furnaces where freight is to be procured, and that is the inability of its cars to run upon connecting lines without the expense of putting down a third rail. The cost of building the Painesville and Ashtabula road is stated at $20,000 per mile, and its passenger equipment is said to be comfortable and commodious.

THE second annual Time-table Convention of general managers and superintendents of the railroads of the United States and Canada, was held at Chicago on the 13th ult., nearly all the roads being represented. The schedule of last winter was adopted with a few alterations, and will go into operation on the 21st November. The next meeting will be held in Cincinnati the second Wednesday in April. By the action of the convention no road will be allowed to run passenger trains at a faster rate of speed than that laid down in the schedule. Nothing was done regarding the fast mail train.

AN improved hydraulic motor for running light machinery—a Swiss invention—is said to answer an admirable purpose in many of the smaller industries. The apparatus consists of an oscillating engine placed within a perfectly water-tight outer casing, into which the water enters at one side and leaves at the other. The oscillating engine cylinder, driven by the water, swings in bearings, suitable entrance and exit ports of the bearing permitting alternately the entrance and discharge of water from the cylinder. The piston rod of the cylinder is pivoted to a crank disk of the driving shaft, and the power is transmitted to the machinery by a friction cone and belting, and can be arranged to run the same at different speeds. The regulating air chamber secures uniformity of motion under various pressures. The casing is attached by screws at any suitable point near the machine to be operated, and the water can be conveyed thereto by rubber pipes. No oiling is necessary, as the apparatus works entirely in water, which forms a sufficient lubricant. This kind of motor must prove very useful, as it is said to be capable of making from 120 to 500 revolutions per minute, with an average water consumption of forty gallons.

THE latest discovered preventive of boiler incrustation is zinc. It appears that an engineer on board the French steamer *St. Laurent*, after making some repairs in the boiler, accidentally left therein an ingot of zinc. Some time after, in searching for the bar in the generator, in which, meanwhile, steam had been maintained, he found to his surprise that the metal had disappeared, and also that the incrustation left by the water, instead of being hard and firm, was a mere mud, easily washed out. Repeating the ex periment during another voyage, the same result was reached. It is also stated that M. Leseur, a French chemist, after examining into this remarkable circumstance, concludes that the zinc forms a voltaic couple with the iron of the boiler, zinc being the positive pole and the iron the negative. It then happens, as in all batteries, that the zinc is consumed, while the iron is protected both from oxidation and incrustation.

AN ingenious apparatus has been introduced in some of the English workshops with great satisfaction, for trimming off wrought iron locomotive wheels. It is a curvilinear slotting machine, and is mounted in a holder provided at one end of a vibrating lever—the other end of this lever being slotted and fitted with a sliding block, into which the pin of a disk crank enters. As the crank disk revolves with its upper edge approaching the fulcrum of the lever, the effect of the arrangement is to give the tool-holder a slow downward and a quick return stroke. The point of this machine describes, of course, an arc of a circle struck from the centre of the vibration of the lever, thereby producing a convex form of the inside of the tire, and so giving additional strength to the rim. The wheel bed plate is revolved by suitable automatic mechanism, somewhat similar to the devices ordinarily employed in planing machines. Provision is made by crank and screw, for wheels of any diameter.

THE *Springfield Republican*, in commenting on the Wisconsin address of Mr. Charles F. Adams, Jr., says: "The great thing lacking now in the treatment of railroads is accurate information. This must be reached by a new and uniform system of statistics. At the present time, even in Massachusetts, there is a great lack of method, and great absence of uniformity in the unmethod, so to speak. Not much of this lack is occasioned by dishonesty, but most of it by ignorance and carelessness. Railroads have not been in the habit of keeping accurate returns, and do not know how to do it, to say nothing of their reluctance to employ the clerical force. Take, for instance, the matter of running expenses; one road will consider as "running expenses" all it spends on the road; another will cover only the actual expense of service, not including permanent repair, or even temporary repair. In consequence of the confusion on this subject, the public are, to-day, paying to some of the roads freight charges large enough to defray the expense of extensions and permanent improvements, when, in justice, all such improvements ought to be made with new capital, subscribed and paid in. Other roads, on the contrary, which do a poor business, report a surplus of net earnings, when in fact they do not make the necessary repairs which should be included in running expenses."

THE Land Department of the Central Pacific Railroad Company has for the past eighteen months been engaged in collecting specimens of the products of the Pacific coast for exhibition next summer at Philadelphia. These specimens will embrace a great variety of mineral, cereal, zoological, ornithological and other products, including a large collection of marine, land and fresh-water shells; timber of various kinds, green, polished, and petrified; cuts from the old monarchs of the forest; specimens of numerous grades of coal; birds of every plumage, animals of every species, curious alkaline formations, honeycombed lava, fossilized fish, reptiles, borings from artesian wells, curious relics, samples of ores, nuggets, the tallest corn-stalks, heaviest sheaves of wheat, etc., etc., all of which will be classified with the utmost care. The cabinet for the safe-keeping of the rarest and most beautiful shells is a model of beauty in design, and altogether the display will be one of the attractive features of the great exposition.

MR. A. W. HUMPHREYS, of New-York, a practical man whose observations on iron making and railroading are reported by the New-York *Tribune*, says that the cars bringing ore and coke to the iron furnaces in England were marked 13,000 pounds, and in some cases as low as 12,000 pounds, or 6 tons. This was the weight of the car. The load of ore they carried was 19,000, or 9½ tons. In this country, Mr. Humphreys remarks, the cars weigh 18,000 to 20,000 pounds, and carry about ten tons of freight. Our cars, therefore, are about a third heavier than the English, and carry only about the same weight of paying freight, or, to put it in a different way, they carry three tons of dead weight more than they need to.

THE managers of the Erie, Baltimore and Ohio, Cleveland, Columbus, Cincinnati and Indianapolis, and Atlantic and Great Western Railroads, have made arrangements for a new line from New-York to Chicago, to be called the Atlantic and Chicago Railroad. Two trains per day will be run at first, to be increased to three if required. All the cars will run through, each company furnishing a certain number of passenger and freight cars, and also locomotives. Each train will have a Pullman parlor and also a sleeping car, and the time made will be the same as on other routes. The headquarters of the management will be in Chicago.

THE Cleveland Rolling Mill Company have completed their gas-well, and are already running one of the sheet furnaces in their plate-mill by the use of gas, at a saving of nearly fifty per cent. in fuel. The well from which the gas comes has a total depth of 1,305 feet; gas was struck at a depth of from eight to nine hundred feet, but the sinking was continued, in the hope of striking an abundant supply. This, however, was not realized, and the supply is barely sufficient to run the one furnace.

AN English paper says that a number of cast iron chilled wheels, manufactured by the Barnum, Richardson Co., of the Salisbury Iron Works, Conn., were recently tested at the machine works of Mr. Horn, Hillbank Row, Westminster, in order to determine the extent of their liability to fracture. The metal partially gave way after being struck 367 times with two hammers weighing 28 lbs. and 32 lbs. respectively.

THREE express cars have just been completed at the Houston shops of the Houston and Texas Central Railroad. They have double arch-bar swing-beam trucks and Cliff elliptic springs. Mr. James McGee is the master car-builder.

The National Car-Builder

PUBLISHED MONTHLY,

BY

VOSE, DINSMORE & CO.

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JAMES GILLET, EDITOR.

Terms, $1.10 per Annum.

NOVEMBER, 1875.

Editorial Announcements.

CORRESPONDENCE.—*We cordially invite the co-operation of the railroad public in affording us the material for a good mechanical paper. Articles relating to rolling-stock and machinery, by those practically acquainted with those subjects, will be gratefully received. All communications must be addressed to Vose, Dinsmore & Co., No. 32 Warren Street.*

ADVERTISING RATES.—*For one square, or one fifth of a column, $5 per month, or $50 a year. For half a square, $3 per month, or $25 a year. Larger advertisements by special contract.*

All communications in regard to advertising should be addressed to L. F. DINSMORE, *Post-Office Box* 4055, *New-York City, who is our agent for advertising, and authorized to make contracts, collections, etc.*

ENGRAVINGS AND ILLUSTRATIONS.

We would invite the attention of Master Car-Builders and others to the advantages to be derived from publishing in THE NATIONAL CAR-BUILDER *engravings designed to illustrate the various features and details of car construction, and especially such improvements as can not otherwise be clearly presented. We will procure cuts to be made in the best manner from drawings or models that may be sent us, and charge only for the cost of engraving, inserting the same in our paper with suitable descriptive details, without charge.*

Car Painting.

THE address of Mr. McKeon on this subject, which appeared in our last issue, and also that of Mr. Stines, which will be found in our present number, contain many valuable suggestions which can not fail to enlist the attention of railroad men and especially car-builders. The Car-Painters' Association, of which these gentlemen are members and prominent officers, is an organization which is doing much to improve the character of work done in the paint-shop; and if we are to judge from the tenor of the discussions at the recent meeting of this Association, there is room for improvement, both as regards utility and the display of taste in decoration. The painting of cars is so different from the other processes of construction, that it is hardly a matter of wonder that the subject is seldom or never alluded to at the meetings of the Car-Builders' Association. It is a vocation requiring special qualifications, and a thorough knowledge of the nature and quality of the various ingredients used, their adaptation to different materials and surfaces, as well as to the varying conditions of climate and temperature. The car-painter must also have a nice perception of the subtleties and refinements of tone and color, so that his work, aside from its bare utility in protecting the surface of the car body, shall satisfy the critical tastes of a discerning public. It is in its nature artistic rather than mechanical. The outside treatment of passenger cars, for example, is much of it purely decorative, and wherever decoration is attempted, upon cars, buildings or other structures, the esthetic judgment is brought into play, and the work will ultimately be approved or condemned exactly in proportion to its conformity with the laws which enable us to discriminate between what is intrinsically beautiful or ugly in the combinations and diversities of form and color. The colors may be of the finest texture, and applied in accordance with the most approved methods known to the craft, and yet they may be so incongruous and ill adapted to the character and uses of the structure they are designed to embellish, as to be an offense to every beholder. Where ornament of any description is used capriciously, subject to no restraint, and in disregard of the limitations and requirements of true art, its fantastic freaks and whimsical absurdities may attract for the moment the vulgar gaze, but being destitute of any real life, meaning, or true decorative power, it soon comes to be regarded with indifference or aversion.

So far as our own observation goes, there are not many cars, we are glad to say, that are obnoxious to this kind of criticism. Very great improvement has of late been manifest in their exterior embellishment. There is less toy-work, less of the flaming and gorgeous, less of the kaleidoscope style; indeed, there are some indications of a tendency towards the other extreme—the somber, funereal and hearse-like. As in the case of most other extremes, a medium would be more in accordance with good taste. It is false economy to expend money and toil in beautifying with fine and elaborate ornament things that can only be seen in the surging turmoil of life, when the mind is necessarily preoccupied and deprived of the temper and discretion suited to the contemplation of it. We can not mix ornament with business without somewhat of detriment to both. Why then should so much time and labor be expended in the outside painting of cars, giving them a finish like a piece of rosewood furniture to be put in a show-room. They are seldom at rest except at stations and in track-yards, and these are poor places for organizing picture galleries. Paint is necessary to protect the wood from the weather, and whatever ornamental features are introduced should be in harmony with the obvious uses of the vehicle, without superfluity or extravagance. The general tone, whether light or dark, should not be marred by startling and violent contrasts. While a monotonous uniformity in the outside treatment should be avoided, the lighter shades, such as yellow, buff or straw-color, relieved by darker striping and neat, legible lettering, are doubtless more pleasing and satisfying to the eye, besides retaining their luster for a longer time and being more durable than the darker maroon tints.

A member of the Car-Painters' Association, at its recent meeting in this city, said he had been a painter more than fifty years, and what he *didn't* know on the subject would fill a very large book. This gentleman may have been exceptionally modest in his estimate of his own professional knowledge, but if painters of skill and long experience are sometimes at fault and commit errors of judgment, what are we to conclude with respect to railroad managers and officials who prescribe as they often do what the style and character of the painter's work shall be? The painter is too often compelled to adapt his work to circumstances over which he has little or no control; his own better judgment is often set aside, a useless outlay incurred where it might have been avoided, excessive ornamentation lavished where it is out of place, or permanence and durability sacrificed to a small saving in first cost. Every intelligent painter knows what managers and officials often fail to perceive, that the cheapest work, on a basis of actual cost, and that which must be turned out in the shortest time, is rarely or never the most economical. If, as Mr. McKeon says, twelve weeks are required for a good job on passenger cars, it necessarily follows that work which must be completed in half that time is not such as to do credit either to the painter or the road.

We are inclined to the opinion that as a rule, the outlay for mere decoration, and the artistic resources of the painter, so far as they can be made use of, should be expended on the inside of cars where the work can be better studied and appreciated. Here the ornamental details are not likely to escape attention. They are at present, however, confined mainly to cabinet-work and upholstery, with which the painter has little to do. The tendency is to dispense with all painted surfaces except head-linings, and it is even proposed to substitute for these a plain wood finish like that of street cars. There is doubtless room for the development of new features of inside finishing; the reign of rosewood, mahogany and black walnut will not last always. The necessity of greater economy in railroad expenditure is likely to bring cheaper woods, and even the neglected art of graining, more into favor as a substitute for costly cabinet-work, in a large class of passenger cars. The "palatial" mania can hardly be carried farther than it has been; it may remain stationary, but it is more likely to give place to new styles and modifications. These may not be better or worse than present ones, but the change will indicate that the resources of artisans, designers and builders are not limited by standard regulation methods merely because they are prescribed by present custom.

The Warming of Passenger Cars.

THE approach of winter with its variable temperature fluctuating between freezing-point and zero, brings into requisition the various plans for warming cars. We do not suppose that the methods employed will be materially different from what they have been. These methods, it must be admitted, are not altogether perfect; and so far as the use of the ordinary stoves is concerned, the heating of cars is a kind of necessary evil in which comfort alternates with discomfort, and is also attended with some degree of danger. Our ordinary passenger cars, in respect to their liability to take fire from stoves in case of an upset, are very ugly traps. They are virtually long boxes, with their insides covered with paint and varnish, and every particle of moisture absorbed by the heated air. Contact with a live coal sets these combustible materials instantly in a blaze. There is only a narrow door for exit at each end, which is exactly the place where, in the contingency supposed, the car takes fire, and the fifty or more wounded and terrified passengers, all wanting to get out at once, are a fatal obstruction to each other in their efforts to escape. Such occurrences, it is true, are not very frequent, considering the enormous passenger-train mileage of all the roads; but they have happened, and in all probability will happen again. A cry will then be set up against car stoves, and a multitude of remedies will be proposed by humanitarians, amateur mechanics and others of an ingenious turn of mind, after devoting half an hour or so to a careful consideration of the subject. A favorite method often recommended by this class of inventors, is to use the waste steam, or steam directly from the locomotive boiler; some propose a separate steam generator, others hot water circulated through the train in pipes, or a water chamber in connection with stoves so as to extinguish the fires in case the cars are overturned. The most of these plans being impracticable, or attended with disadvantages which have thus far prevented their adoption, it is of little use to discuss them.

There are a great many evils in the world which can not be entirely got rid of except by methods which produce other and worse evils. One of these is a car stove, or fire in or about a car for warming purposes. The vast majority of people will cheerfully incur a slight risk of being "done brown," rather than ride in cold cars and contract maladies incident to such exposure. There would seem then to be no other way but to continue the use of stoves in some form; and inasmuch as side-doors are not likely to be put in cars to facilitate the escape of the passengers in extreme emergencies, the stoves should be made of such form and material as to insure comparative safety. By constructing them of good boiler-plate

iron, well riveted together, and so securely fastened in their positions as not to be displaced or broken in the event of a collision or upsetting of the cars, the danger of sudden conflagration would be greatly diminished. This is certainly practicable. If the fire is locked up in a tough wrought iron receptacle not likely to break even when partially crushed, there would be much less danger of a holocaust in case of an ordinary derailment or smash-up, although bodies might be mutilated and lives lost. Stoves made of cast iron should be discarded, especially if the castings are thin and insecurely fastened together, as they are very likely to be when designed for use in buildings. We do not know to what extent wrought-iron stoves are used on our roads, but our impression is that at present they are not the rule but the exception.

In connection with this subject, we must allude to the very great necessity which exists for a better *distribution* of heat in railway cars. What is wanted is a medium temperature from floor to roof; and this, in cold weather, is just what the occupants of ordinary passenger cars seldom or never experience. Nor is this at all surprising, when the usual methods of ventilating and warming are considered. When the two stoves have filled the car from window-sills to roof with a heat past endurance, then the top ventilators are opened, and the hot air rushes out like gas through a hole in the top of a balloon, and the cold air rushes in correspondingly at every opening near the floor. The difference between the temperature at the floor and roof varies in winter from 30 to 50 degrees, causing both head and feet to suffer, the former being too hot and the latter too cold. This state of things can not in our judgment be remedied so long as a large portion of the heat generated by the stoves is wasted by being allowed to escape through top ventilators instead of being utilized, and it can not be properly utilized until the importance of exhausting the air through openings at or near the floor is more generally recognized, and the necessary provision made for it. Either this must be done, or the warmed air must be introduced or radiated from the floor or along the sides of the car below the seats, the essential thing being to secure uniformity of temperature, a better distribution of the heat, and at the same time a constant supply of fresh air.

The Meetings at the Car-Builders' Association Rooms.

AFTER an interruption of several months, the regular meetings of the Car-Builders at the Association Rooms in this city have been resumed. It is now nearly three years since these rooms were opened, the object of which was to provide a place of resort for railroad men to be used as a business and social exchange, and for regular meetings of car-builders, supply manufacturers and others. We think that all who have participated in these meetings for the past two years, appreciate the advantages to be derived from them. The rooms are a depository for models and drawings illustrative of railroad mechanism, and especially of such as relate to new and improved devices in car construction. These accumulate from year to year and already constitute an extensive and valuable collection. A register is kept in which the names of visitors are entered; there are also files of railway and scientific papers, facilities for writing, etc. The rooms are open at all times except on Sundays. From the first, the monthly meetings have been well attended, and have been the means of a more critical and thorough investigation of numerous problems which directly affect the economical operation of railroads in the matter of rolling-stock. The subjects for discussion are announced a month in advance, and any one present is at liberty to state his views, and also to exhibit and explain any invention or device pertinent to the subject in hand. It is customary for an officer of the Association to preside on these occasions, but the proceedings are not so rigidly formal as to prevent the free interchange of opinions, and consequently the discussions often become more conversational than otherwise.

It is important that the interest of these meetings should not only be kept up, but that they should be made more interesting and attractive by addresses or the reading of papers upon special subjects by scientific men, illustrated by suitable experiments and tests. There were several addresses and exhibitions of this kind at the rooms last winter, which were exceedingly interesting, and afforded much needed light upon the questions of ventilation, heating, strength of materials, qualities of timber and metals, etc. It is expected that a number of papers upon mechanical and scientific subjects will be read at the meetings to be held during the coming winter, and that the subjects to be considered will not be restricted altogether to car-building as a specialty, but will embrace other topics connected with railroading. The object is to bring distinctively theoretical and distinctively practical men together, so that the knowledge derived from books, and that acquired in the shops, shall be mutually helpful. The fact is apparent that the more any particular subject is discussed the more it widens; attention is drawn to many little things which were before overlooked, an interest is excited which leads to more careful inquiry, individual views are modified and prejudices worn away.

Railroad officers of the higher grades have hitherto held aloof from these meetings, and have so far deprived them of much valuable support and encouragement. Their presence and participation in the proceedings would contribute much to the interest and usefulness of the discussions, and it is to be hoped that in future the association will have the benefit, to some extent at least, of their co-operation.

Common-Sense Ventilation.

"THE best practical statement I have met about ventilation," says Colonel Waring in the last *Atlantic*, "was contained in the remark of a mining engineer in Pennsylvania. 'Air is like a rope; you can pull it better than you can push it.' All mechanical appliances for pushing air into a room or a house are disappointing. What we need to do is to pull out the vitiated air already in the room; the fresh supply will take care of itself if means for its admission are provided. It has been usual to withdraw the air through openings near the ceiling, that is, to carry off the warmer and therefore lighter portions, leaving the colder strata at the bottom of the room, with their gradual accumulation of cooled carbonic acid undisturbed. Much the better plan would be to draw this lower air out from a point near the floor, allowing the upper and warmer portions to descend and take its place. An open fire, with a large chimney throat, is the best ventilator for any room; the one half or two thirds of the heat carried up the chimney is the price paid for immunity from disease; and large though this seems, from its daily draft on the wood-pile or coal-bin, it is trifling when compared with doctor's bills and the loss of strength and efficiency that invariably result from living in unventilated apartments."

Completion of the Hell-Gate Excavations.

ON July 4, 1876, the great explosion which is to shatter the submarine rocks at Hallett's Point and open a navigable channel for vessels of large draught coming and going through Long Island Sound, to and from New-York City, will take place; such, at least, we understand to be the present intention of those in charge of the work. The excavations were completed about two months ago, and the operation now in progress consists in the boring of the holes in which the heavy charges of nitro-glycerine are to be placed. These borings are about half finished, and will require the labor of two or three months longer, after which two months more will be occupied in inserting the charges.

The entire surface undermined measures 2¼ acres, and the cuttings aggregate 7542 feet in length, varying in height from 8 to 22 feet, and in width from 12 to 13 feet. There is a roof 10 feet thick between the mine and the water; and the latter, at the outer edge of the excavation, is 26 feet deep at low tide. Between the headings and galleries heavy piers are left, which now sustain the immense weight of rock and water above. In each pier from ten to fifteen 2 and 3 inch holes are being drilled, and in the roof similar apertures are being made at intervals of 5 feet apart. All of these openings will be filled with nitro-glycerine, in charges of 8 and 10 pounds, and all will be connected together by gas-pipe filled with the same explosive. This will be done during the cold weather, when the danger of hauling the nitro-glycerine is greatly diminished.

Previous to the explosion, the coffer-dam will be broken away, and the water allowed to fill the entire excavation, so that it will serve as a tamping. Then, by means of an electric fuse, the nitro-glycerine in the gas-pipe will be fired, which will determine the blowing up of the whole affair. No fear is apprehended as to the result, since it has been determined that the explosion of half the charges will be sufficient to cave in the roof, and cause it to fall to the sunken floor, deepening the water at once to a proper depth, or necessitating but little dredging to complete the work. —*Scientific American.*

Stone's Double Automatic Coupler.

THE value and effectiveness of this coupler appeared to excellent advantage a few weeks ago on the Erie Railway where a large number of them are in use. A severe collision occurred near Goshen between a milk and coal train, the latter having one passenger car attached. The engine of the milk train ran half through the passenger car, and such was the force of the shock, that seven coal cars were completely demolished, and ten badly disabled. The milk cars, being equipped with Stone's couplers, received little or no injury, and as soon as the track was cleared proceeded on their way. This was due to the peculiar construction of the device, an illustration and description of which will be found in our January number of the present year. There are four buffer springs to each car instead of two, and these are placed in the heavy sill-timbers instead of the ordinary iron drawheads. There are also four buffers, with revolving heads and two strong iron hooks, forming a double coupling. The strength of this arrangement prevented a crash, and kept the cars in line without telescoping or piling up.

THE Cayuta Wheel and Foundry Company, at Waverly, N. Y., has been steadily increasing its business since its organization a few years ago. Within the past few weeks its wheel product has been doubled. By the use of superior iron, great care in the processes of manufacture, and unremitting attention to the wants of railroads, the Company has taken its place among the best wheel-makers of the country. The quality of its wheels is now being tested upon roads in England and Scotland with marked success, and the orders received from home roads are numerous and constantly increasing.

MR. ALBERT FINK has retired from the position of General Superintendent of the Louisville and Nashville Railroad, and it is reported that he will in future act as the common agent of a number of Southern roads, with the view of harmonizing their competitive interests so as to be mutually satisfactory; or in other words, he undertakes to operate a system of roads as one road, a problem he is peculiarly fitted to deal with, from his ability and experience as a manager, and his thorough acquaintance with the complexities of railway transportation.

Car-Builders' Monthly Meeting.

THE first regular meeting for several months past, was held at the rooms of the Association, in this city, on Thursday evening, Oct 21. The subject for discussion, in accordance with previous notice, was Car Wheels, embracing the various points involved in their manufacture and practical service. The discussion was for the most part conversational, and was continued during the evening. There was a good attendance of car-builders and car wheel makers, who gave the results of their experience with reference to the comparative merits and service of wheels, and the best material and methods of manufacture.

Mr. Forney opened the discussion by calling attention to some experiments that had been made by turning off the chill of cast-iron wheels, and suggesting that the spots that often appear on the tread might be owing to this process.

Mr. Lobdell, of the Wilmington Car Wheel Works, said that the experiments referred to were made by him on a pair of hollow-spoked wheels that had run $11\frac{1}{2}$ months, one of which had developed blotches while the other was free from them. He had them both turned off $\frac{3}{16}$ of an inch, and then put them under a locomotive, where they had been running since last May without the appearance of any perceptible wear. The wheels were 26 inches in diameter. The blotches were just under the surface, and were entirely taken off by the turning. From a day to a day and a half was required for the turning of one wheel, a more powerful lathe being required for turning a chilled iron wheel than for a steel wheel. With proper facilities, however, it might be done in less time.

Mr. Partridge referred to an instance in which an emery wheel had been made use of instead of a turning tool, for removing the inequalities of surface on the tread, and with very satisfactory results, the wheels so treated performing excellent service afterwards.

Mr. Lobdell said that this process was necessarily much slower than turning with a tool, as it required from three to four hours to grind off a journal made of soft iron so as to make it perfectly true. There were low places in wheels which it would take a long time to get out by such a process. Wheels would often run from 30,000 to 35,000 miles before being turned, and the turning would render them capable of half as much more service, whereupon

Mr. Forney suggested that the economy of the thing resolved itself into a simple question of the rule of three. If an ordinary wheel costing $15 would run 50,000 miles, we could well afford to pay half the original cost for 25,000 miles additional service.

Mr. Chamberlain thought that after a wheel had run 50,000 miles there was not much chill left, and that the wear would begin to get into the gray iron. A wheel running 60,000 miles would wear away $\frac{3}{8}$ of an inch. He thought the service of wheels should be estimated by their mileage, and not by the time they had been on the roads.

Mr. Lobdell said that as respects service, much depends on the hardness of the chill; some wheels with a hard chill of half an inch, would run longer than others with an inch chill that was softer.

Mr. Davenport, of the Erie Car Works, said that care in the use of wheels was the essential thing. A pair of wheels guaranteed to make a certain mileage were often returned to the makers on account of failure, when there was still remaining a good depth of chill; and upon examination it was found, in one case within his knowledge, that a No. 4 and a No. 6 wheel had been put on the same axle, these numbers indicating different sizes. The unfitness of the wheels to work together had been entirely ignored, and this explained the grinding process so often observed and complained of. Carefulness in boring and fitting was extremely important; a very slight imperfection in the hole made a great difference with the tread. Some trains hauled as hard as a cat by the tail, when the trouble was all in the bad fitting of one or two wheels, perhaps. Take out the cars having these wheels, and the train pulls easy enough. These hidden things which could not be seen, were taxing the power and wearing the track.

Mr. Baker, of the Baltimore Car Wheel Works, said that the character of the chill depended to a great extent on the temperature of the metal when poured; if the metal was very hot and fluid, the result was a greater percentage of chill-cracks, but the chill was more uniform than when the metal was cooler. The risk of chill-cracks involved more expense, however.

Mr. Chamberlain said that no wheel-maker could make two wheels of exactly the same size and same chill. An eighth of an inch out of true would cause flange-wear sufficient to destroy a wheel in running 16,000 miles. The imperfections developed in the running of wheels were not all owing to bad fitting by the car-builders. Why was it that wheel manufacturers now made better wheels than they did years ago? Why is it that some wheels run 35,000 and others 16,000, and so on up to 105,000, all of the same make, of the same iron, and cast on the same day?

Mr. Davenport said that the improvement in wheels was due to more careful investigation, establishing laboratories, analyzing stock and the results of mixtures, and getting at causes which had heretofore been guessed at. The car-builders had brought this about by setting the wheel-makers to work to do their very best. Science, in coöperation with experience would insure better and evener results. As for the difference in wheels of same stock and same make, a difference in the temperature of the metal would alone account for it.

Mr. W. W. Snow attributed much of the trouble experienced with wheels, and particularly flange-wear, to the patterns of rails. These patterns varied, especially the tops, some being wide and flat with greater bearing surface, while others were the reverse, and this without any regard to the effetc upon the wheels. It was very evident that there should be a proper correspondence between the rail and wheel surfaces to insure the least wear of both.

Mr. D. A. Hopkins referred to an instance many years ago in which he fitted a new wheel on an axle to replace a defective one. The mate was not removed; it had been running a considerable time, and was without a blemish, its tread being remarkably clean, clear and bright. The new wheel, however, was a little larger in its diameter, and in running, the clean and bright wheel had to slide, of course, to keep up. The result was that in a very short time no less than 13 flat places appeared on the face of the tread, caused by its being less in size than its mate.

Mr. Davenport referred to the fact that wheels now-a-days were subjected to harder service than in former times. Many of the so-called wonderful wheels made years ago and credited with extraordinary performance and durability, had been used on slow trains and mostly in the summer, and had really made far less actual mileage than was supposed. The fast mail trains of the present time would knock to pieces more wheels in a week, than the old-fashioned slow trains would in a year—yes, in five years.

The discussion, or rather conversation, was continued at great length, in which most of the gentlemen present participated. The above brief summary merely indicates the drift of what was said. The matters discussed having reference to the intricacies and technicalities of wheel manufacture, nothing short of a full verbatim report, carefully revised and corrected, could do justice to the speakers by making what was said intelligible to our readers. This we regret we are unable to give, owing to the absence of a phonographic reporter who was expected to attend the meeting.

The next meeting will be held Nov. 18th, when the subject of *Car Axles*, with reference to their weight, material, dimensions, fitting, etc., will be discussed.

Steel and Iron Rails.

THE Road-Masters of the Atlantic and Great Western Railway held a conference in June last, the proceedings of which have just been printed in pamphlet form. From a summary of what was said, prepared by the *Railroad Gazette*, we take the following:

"There was a long discussion on the comparative value of steel and iron rails, in which various opinions were given, no one apparently having had enough experience with steel to feel quite sure as to the limit of its durability. One man had known a steel rail to outlast five iron rails; another said that on the Erie, where there was steel for five miles on one side of the track and iron on the other, the iron had been renewed eight times, while the steel was good yet. Others thought that steel would last ten times, five times, twelve times, four times, five or six times, and seven times as long as iron. One road-master said: 'A road-master on the Pennsylvania Railroad had been 21 years on the road, and did nothing but repair track. He and I were together till a year ago this month. He had removed but 30 per cent of the steel rails on his road after 12 years' wear. He had about the heaviest steel rail on the road—70 lbs. to the yard. There was an average of 36 trains a day—three engines and about 50 cars to a train.' Another knew a yard where the best iron wore out in three months. Steel rails weighing 70 lbs. to the yard were put in. Some of these have been in two years and a half, and the joints do not show much wear. In the Meadville yard of their own road, steel rails had served three years and five months, while iron wore out in three months. The enginemen agreed that they could haul one car more on steel than on iron rails through a certain curve on the road. In the Cleveland yard steel rails still good had outworn twelve iron rails. One road-master believed that more steel than iron rails were broken in winter. These breakages were generally at the holes for the joints. They were not caused by the heaving of the rails. Some of the road-masters had had several steel rails broken by flat wheels, as they believed. None had been broken where the double joint was used.

Things to Look Into.

THE great end at which all improvements aim is the maximum of power combined with the minimum of material and weight. A man shoveling dirt with a shovel one pound heavier than it should be, will lift 6000 pounds more in a day of ten hours than he would do with a suitable shovel. All this strength is wasted. The same is true of machinery. So simple a thing as an unlubricated pulley is felt in the furnace, and the cost of the coal is augmented. Every useless pound in a truck or carriage takes vitality from the horse which draws it, and costs the owner many extra dollars for his keeping. The man who pulls an oar in the great boat races at Saratoga, puts himself in training and reduces every ounce of surplus flesh. The racing horse carries not one extra ounce of fat to burden him in the effort to win. Yet workingmen will carry, through half their lives, fifty pounds more flesh than is needed for the best working condition, a burden which tells against their efficiency and personal comfort through many years of their industrial life. These may seem little things; but whatever wastes power, increases expenses, and burdens the laborer, is not a little thing.

THE New York branch office and warehouse of W. C. Allison & Sons, have recently been removed from 85 Liberty, to 78 John Street. The main office and works are on Thirty-Second and Walnut Streets, Philadelphia. The concern is widely and favorably known as manufacturers of railway cars, tubing, forgings, castings, etc.

Vulcanized Fiber.

THIS valuable material is adapted to the same uses as caoutchouc and gutta-percha, but is very different in its character, being manufactured from a base of vegetable fiber in the form of paper or paper pulp, by a process of vulcanization which entirely changes the original properties of the raw material. It is tough, elastic and insoluble, and does not deteriorate under any conditions of climate or ordinary exposure. It is anti-frictional and a non-conductor; will absorb water and thereby become expanded and more flexible, but will not absorb oil, petroleum or other fluids except so far as they may be diluted with water. It can be made as hard as ivory, as tough as horn, or as soft and flexible as leather, according to the use to which it is applied.

We desire more particularly to call attention to its capacity for rendering car roofs, and especially the roofs of freight cars, impervious to water. A tongue of the fibre suited to the purpose, is inserted in deep grooves cut in the edges of the roof boards, making a tight joint; and in case any dampness or water penetrates the joint so as to come in contact with the fiber, it at once swells and packs tight, the shrinkage of the lumber not affecting the tightness of the joint. It is also used for engine gibs to great advantage as respects cost, consumption of oil, and wearing of slides. Manufactured by the Vulcanized Fiber Company, of Wilmington, Del.; New-York office, 17 Dey street. See advertisement, page x.

THE extension of the Long Branch Division of the New Jersey Central is completed to Sea Girt, four miles beyond Ocean Beach, and 12 miles south of Long Branch. The Long Branch Division is 46½ miles long, from the junction with the main line at Elizabethport south to South Amboy, then east by south to Long Branch, then south again to Sea Girt.

MR. CHARLES FRANCIS ADAMS, JR., is preparing a series of articles for the Atlantic Monthly, giving an account of the notable railroad disasters in this country since 1829, with observations on their beneficial results in hastening the adoption of improved safeguards against accidents.

NARROW-GAUGE railways are meeting with considerable favor in Switzerland. The longest road of this class now in course of construction is that from Geneva to Lausanne, along the Jura mountains. Its length is 55 miles. Narrow-gauge tramways have been introduced in Zurich.

THE Erie Railway paid last year for water in Jersey City $22,182; it pays $600 a year for a little water in Goshen; at Middletown, where three tanks are employed, it pays $2700, and at Port Jervis it pays annually nearly $5000. Who, after this, will say that water is cheap?

THE National Locomotive Works, at Connellsville, Pa., have received an order from the Kansas City Narrow Gauge Railway for four engines, two passenger and two freight. The passenger engines will be furnished by the 1st of November and the freight engines the 1st of January.

THE North Chicago Rolling Mill recently made 1010 steel rails in 20 hours. They were 30 feet long, weighed 60 lbs. to the yard, and were for the Chicago, Rock Island and Pacific Railroad. The percentage of second class rails was half of one per cent.

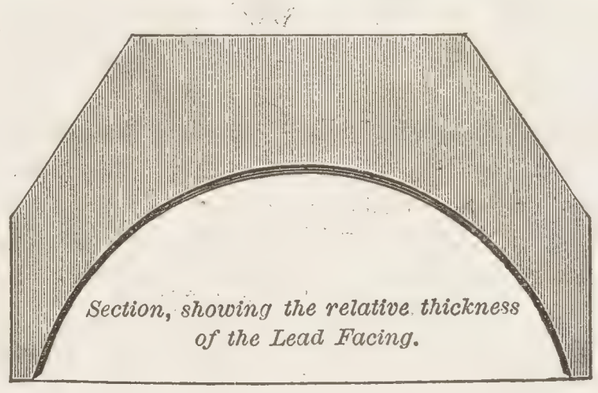
THE New Albany (Ind.) Steam Forge Company has four hammers out of five at work, and is running on a contract for 1,200 car axles.

THE Southwestern Car Company, at Jeffersonville Ind., has contracts for 50 freight cars from the Lafayette, Muncie and Bloomington road, and 50 for the Alabama and Chattanooga.

THE Terre Haute (Ind.) Car Works are building a number of narrow-gauge cars.

Hopkins' Lead-Faced Journal Bearings.

THESE bearings are in use on a number of prominent roads, and their merits are becoming so well known to railroad men that it is almost unnecessary to call attention to their superior qualities. The prime requisites of a good railway journal-bearing are durability, cool running, and small consumption of oil, without cutting or wearing the journal. These are secured in the lead-faced bearing from its capacity to adapt itself to the journal, so that the latter, whether large or small, even or uneven, beds itself into the lead, makes its own fit as in a mould, and at once gets a perfect bearing. The facing itself wears a long time before the brass is reached, equal in many cases to the average mileage of an ordinary brass, and before the wear upon the hard metal, or bearing proper, begins. They have run under heavy palace cars 58,000 miles without heating or wearing out. As compared with Babbitt lining, a recent trial has shown that in a run of 27,486 miles, the lead-lined brass lost but 1½ lbs., and ran 1145 miles per ounce worn, while the Babbitt brass lost 2 lbs., 4½ ozs., and ran only 753 miles per ounce worn. The cut shows the



Section, showing the relative thickness of the Lead Facing.

form of the bearing proper, and the relative thickness of the lead, the latter being only $\frac{1}{16}$ of an inch; if thicker than this, it would be pressed out at the sides and ends. We are informed that a saving of from thirty to forty per cent in the consumption of brasses and axles, to say nothing of oil, waste and labor, and the diminished liability to accident, is the practical result of using these bearings. They are manufactured by George R. Meneely & Co., West Troy, N.Y., and are supplied to any desired pattern, at a price not exceeding that of ordinary brasses. See advertisement, page 173.

THE old "John Bull," the first locomotive ever run on the Camden and Amboy road, which has been laid up at the Bordentown shops for many years, is being put in running order again, and will be sent to the Centennial next year. It was built by Robert Stephenson over 40 years ago; has 12 by 20-inch cylinders, one pair 4½ feet drivers, and weighs about 12 tons.

THE Pittsburg Locomotive and Car Works are completing six standard engines with 16 x 24 inch cylinders, for the Atlantic and Richmond Air Line R. They have also finished three narrow-gauge engines for Western roads. The latter are 8-wheeled American engines with 9 x 16 inch cylinders.

AN order has been issued for the construction at the Altoona shops of 24 additional locomotives for the use of the Pennsylvania Railroad. In order to complete them at as early a date as possible additional workmen will be employed, and the hours of labor increased. Some of these engines will be for freight traffic, and others will be used as passenger locomotives.

A. P. ODELL, of Oil City, Pa., is the author of a new oil tank car, which, if it fulfills the expectations of the inventor when put to a practical test, will greatly lessen the cost of transporting oil to the seaboard. The tank is swung underneath a platform, which can be used as an ordinary gondola car for carrying freight on the return trip. At present the tank cars have to be returned empty, which is a dead loss in freight.

WE desire to call attention to Harker & Co.'s Salamander Anti-Incrustation Boiler Fluid, which is strongly recommended by engineers and others of large experience in the use of steam boilers, as a prompt and effective agent in the removal of scale without injury to the boiler plates. It is manufactured by the above named firm, in Richmond, Va Mr. W. F. Carter, 57 South Street, Baltimore, is sole agent for the Middle States and New England. See advertisement, page 172.

NOYES' Patent Liquid Packing, is strongly indorsed by leading railroads as very effective for cooling hot journals. It is applied by pouring it on the heated journal so as to cool it down, the waste being pushed away so as to bring the liquid in contact with the journal. If there is any fire, a free application of the liquid will extinguish it. The liquid is also supplied in a form suitable for mixing with other oil, which will be rendered from 20 to 40 per cent more valuable as a lubricant, according to size of journal and quality of oil.

Facetiæ.

SHE stepped into the car, radiant with youth, and looking cool and bright in her flower-trimmed hat and speckless suit of linen. Four young men immediately offered her their seats. She accepted one with an entrancing smile, and instantly gave it to a poor, wan, little, old woman who had been standing for ten blocks, whereupon the young men did not know whether to get up again or not, and tried their best not to look foolish.

A CLERGYMAN who owned a farm, found his plowman sitting on his plow, resting his horse. Quoth the clergyman, "John, wouldn't it be a good plan for you to have a good stub-scythe here and be cutting a few bushes along the fence while the horse is resting a short time?" "Wouldn't it be well, sir," said John, "for you to have a tub of potatoes in the pulpit, and when they are singing, peel 'em awhile to be ready for the pot?"

A CHAP from the western part of the State went to bed at one of the hotels the other night, and blew out his gas instead of turning it off. The gas rushed out, the room was close, and in about half an hour the smell became so strong that the stranger got out of bed, opened the door, and shouted for the clerk. The clerk came up and demanded to know what was up. "I never stopped in Detroit overnight before," replied the stranger, "and I don't know but this smell is all right, but it 'pears to me as if something had busted somewhere."

A YOUTH named George was engaged to be married, but was financially unable to call in the minister. His affianced wanted the affair brought to a finale, but George kept putting her off with promises, saying he was unable to marry, etc. Finally, she said, "Deah Gauge, I am willing to marry you, if we have to live on bread and water." "Well, well," cried "Gauge" in desperation, "you furnish the bread, and I'll try and skirmish around and hunt up enough water."

A HASTY man, with his arms full of his wife's baggage, thought he was left by the train last night, and running rapidly across a platform, fell over a truck. He straddled one of the handles and rode it for a second, lunged forward and got his legs tangled up in the cross-pieces, when the malicious thing reared up and slid forward just enough to throw the man off his balance and get him down; he blacked his eye and broke his spectacles against the handle, and ran over his foot with the wheels, and even after he got away from it and was seated in the car, he says the truck ran after him and kicked him twice in the ribs before the brakeman could take it away from him.

NEEDHAM'S
Safety Signal Light,
FOR
PREVENTING REAR COLLISIONS.

Shows in both directions whether the train is moving fast, or slow, or stopped.

In cases of trains uncoupling it is superior to the *"Block System,"* and for safety to trains following, it is the *Best Light in Use,* indicating by the simplest mechanism, both speed and distance.

CARS EQUIPPED FOR TRIAL FREE.

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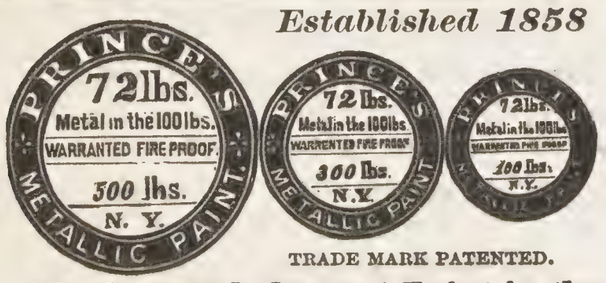
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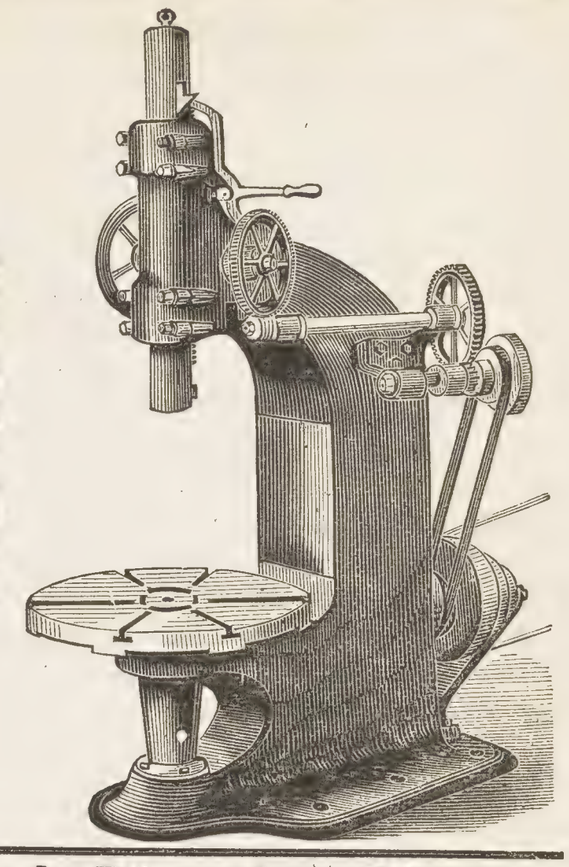


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will repair and preserve old roofs of shingles, tin, cement, or of any kind, cheaper and more substantially than any thing else in use. It has been tested and improved upon for ten years, and is a perfect protection against *weather* and *fire*, and is indorsed by EIGHTY-TWO FIRE INSURANCE COMPANIES. Reference is made to over 2000 ROOFS in New-York—on CHURCHES, BROWN STONE DWELLINGS, FACTORIES, etc. It is equally good for *steep* or *flat* roofs, and is easily applied on old or new buildings.

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Plastic Slate Cement, for pointing up chimneys, etc., 10 cents per pound.
One, two, and three ply Roofing Felt and Building Paper, 1, 2, and 3 cents per square foot.
Materials put up for shipment to any point, with simple instructions for use.
Country merchants should sell these Improved Plastic Slate Roofing Materials, as they can recommend them with entire confidence

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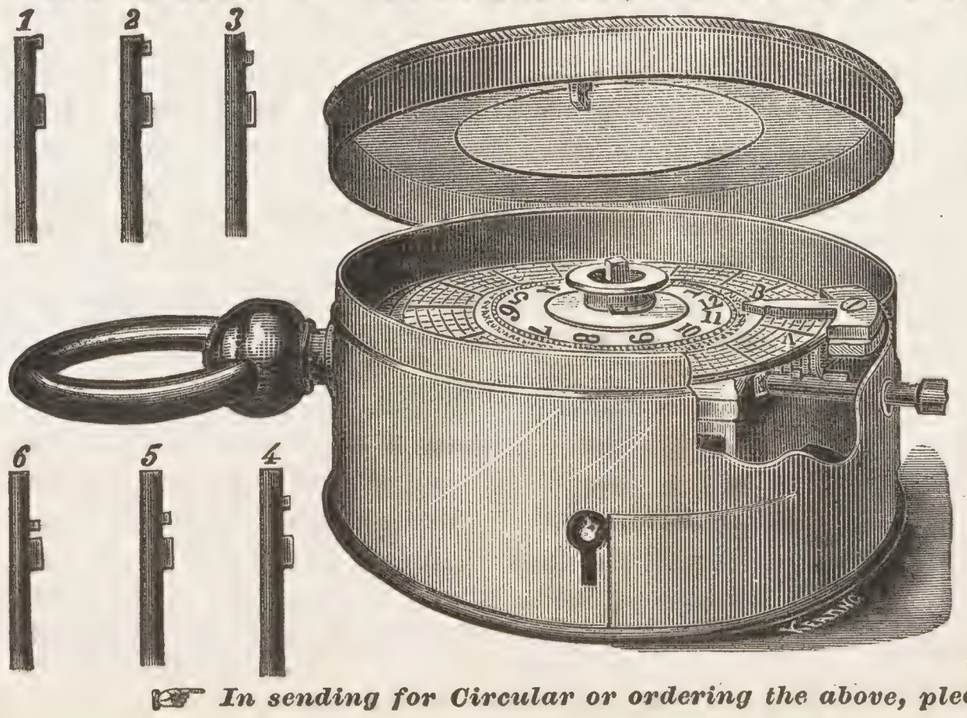
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N. B.—The public are notified that in my suit against *Imhaeuser & Co.*, of New-York, a decree was made in my favor, June 10, 1874.

Proceedings have been commenced against said *Imhaeuser & Co.* for selling clocks contrary to the order of the Court, and especially the clock with a series of springs in the cover and marked, "Patented October 20, 1874."

All persons discovered using these infringing clocks will be dealt with according to law.

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Brill, J. G. & Co	Philadelphia, Pa.
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Canada Car Co	Toronto, Canada.
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Central Car & Manufacturing Co	Jackson, Mich.
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Cummings Car-Works	Jersey City, N. J.
Connellsville Machine and Car Co	Connellsville, Pa.
De Pere Iron-Works	De Pere, Wis.
Detroit Car-Works	Detroit, Mich.
Dawson Manufacturing Co	Dawson, Ga.
Dickey, Neill & Co	Toronto.
Dickson Manufacturing Co	Scranton, Pa.
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Elmira Car-Works	Elmira, N. Y.
Frederick & Co	Catasauqua, Pa
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Gardner, F. & Co.	Carlisle, Pa.
Gill, John L	Columbus, Ohio.
Gilbert, Bush & Co	Troy, N. Y.
Goold, James & Co	Albany, N. Y.
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Michigan Car Co	Detroit, Mich.
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Murray, Dougall & Co	Milton, Pa.
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Schall, Michael	York, Pa.
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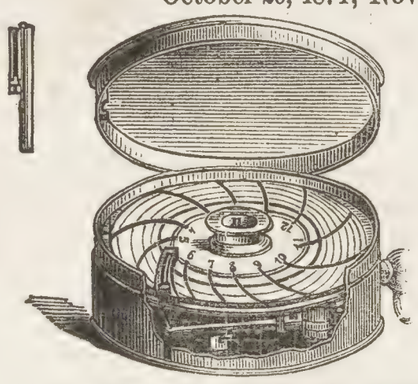
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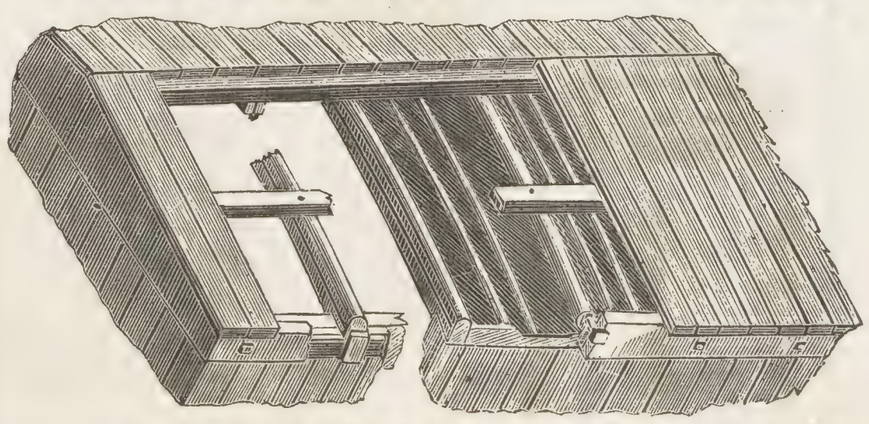
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Central Branch Union Pacific	Geo. C. Benedict		Atchison, Kansas.
Central R. R. of Iowa		T. L. Seevers	Marshalltown, Iowa.
Central R. R. of Iowa	F. B. Woodruff.		Eldora, Iowa.
Central Pacific	A. J. Stevens	Benjamin Welch	Sacramento, Cal.
Western Division	Geo. D. Welch	J. J. Lawler	Oakland Cal.
Visalia Division	S. Johnson		Lathrop, Cal.
Sacramento Division	M. W. Cooley		Rocklin, Cal.
Sacramento Division		Nat. Webb	Truckee, Cal.
Truckee Division	James Velsir	Wm. McPherson.	Wadsworth, Nev.
Humboldt Division	H. L. Stevenson	H. B. Hartsman	Carlin, Nevada.
Salt Lake Division	W. H. McKenzie	G. J. Turner	Ogden, Utah.
California Pacific Division	D. Rutherford	D. Rutherford	Vallejo, Cal.
Central Vermont	‖‖J. M. Foss	J. M. Foss	St. Albans, Vt.
Harlem Extension Div	W. A. Short	W. A. Short	Ruthland, Vt.
New-London & Northern Division	J. W. Dow	J. W. Dow	New-London, Ct.
Ogdensburg & L. Champlain Div.	E. Leline		Malone, N. Y.
Ogdensburg & L. Champlain Div.		Geo. Colepas	Ogdensburg, N. Y.
Rutland Division	W. A. Short	W. A. Short	Rutland, Vt.
Charleston & Savannah	H. T. Calder		Charleston, S. C.
Chesapeake & Ohio	John McFarland.	J. N. King	Richmond, Va.
Chesapeake & Ohio	§T. J. Hamer	H. C. Bassinger	Huntingdon, W. Va.
Cheraw & Darlington	D. W. Haines	A. M. Corrie	Florence, S. C.
Champlain Trans. Co	H. T. Calder		Burlington, Vt.
Cheshire & Ashuelot	F. A. Perry	F. A. Perry	Keene, N. H.
Charlotte, Columbia & Augusta	Robert King	J. C. Troeger	Columbia, S. C.
Chicago & Pacific	A. S. Gurnee		Chicago, Ill.
Chicago & Lake Huron	§§Wm. C. Faulkner		Port Huron, Mich.
Eastern Division	E. Hollis		Port Huron, Mich.
Western Division	Stephen Tinker		Battle Creek, Mich.
Chicago & North-Western	§Geo. W. Tilton	William Campbell	Chicago, Ill.
Wiscon. Mad. & Mill. Divis	Wm. Campbell		Chicago, Ill.
Wiscon. Mad. & Mill. Divis	Henry Hull		Fond du Lac, Wis.
Galena Division	Hugh Gray		Chicago, Ill.
Iowa Division	C. C. Elliott	H. L. Preston	Clinton, Iowa.
Peninsula Division	Geo. White		Escanaba, Mich.
Chicago & Alton	John A. Jackman	R. Reniff	Bloomington, Ill.
Chicago, Burlington & Quincy	‡Wm. Wilson	††W. W. Wilcox	Aurora, Ill.
Galesburg Division	James Lamb	H. J. F. Small	Galesburg, Ill.
Creston Division	Joel West		Creston, Iowa.
Burlington Division	John Bassler		Burlington, Iowa.
Chicago, Clinton & Dubuque	P. R. Sutton		Dubuque, Iowa.
Chicago, Dubuque & Minnesota	P. R. Sutton		Dubuque, Iowa.
Chicago, Rock Island & Pacific	T. B. Twombly	B. K. Verbryck	Chicago, Ill.
Chicago & Michigan Lake Shore	T. J. Hartswell		St. Joseph, Mich.
Chicago, Danville & Vincennes	A. H. De Clerq		Danville, Ill.
Chicago, Milwaukee & St. Paul	J. M. Lowry		Milwaukee, Wis.
La Crosse & P. Du Chien Div.		Wm. E. Kittredge	Milwaukee, Wis.
Northern Div.		John Bailie	Milwaukee, Wis.
Iowa & Minn. Div.	J. Pettee	J. Pettee	Minneapolis, Minn.
Hastings & Dakota Division	C. C. Clements		Hastings, Minn.
Chicago & Iowa	H. S. Bryan		Aurora, Ill.
Cincinnati, Wabash & Michigan	E. M. Porter		Wabash, Ind.
Cincinnati, Hamilton & Dayton	James Eckford	W. H. H. Allison	Cincinnati, Ohio.
Indianapolis Division	Edward Moore		Indianapolis, Ind.
Cincinnati, Lafayette & Chicago	Charles E. Gore.		Lafayette, Ind.
Cincinnati & Muskingum Valley	Leroy Kells	Daniel Jewell	Lancaster, Ohio.
Cincinnati, Sandusky & Cleveland	J. R. Ames	J. R. Ames	Sandusky, Ohio.
Cleveland, Col., Cin. & Indianapolis	‡L. S. Young	††William F. Smith.	Cleveland, Ohio.
Indianapolis Division	A. R. McAlpine		Galion, Ohio.
Indianapolis Division		R. Attridge	Indianapolis, Ind.
Cincinnati Division	D. Carmichael	D. Carmichael	Delaware, Ohio.
Columbus Division	F. G. Kaufholz	Wm. Cleve	Cleveland, Ohio.
Cleveland & Pittsburg	N. E. Chapman	A. Steinbrunner	Cleveland, Ohio.
Cleveland, Mt. Vernon & Delaware	J. W. Holloway	J. W. Holloway	Akron, Ohio.
Cleveland, Tuscarawas Val. & Wheeling	W. F. Turreff		Cleveland, O.
Cobourg, Peterboro & Marmosa	Wm. Polson		Cobourg, Canada.
Columbus, Chicago & Indiana Central	(See Pitts. Cinn. & St. Louis)		
Columbus & Hocking Valley	H. S. Wallace	H. S. Wallace	Columbus, Ohio.
Concord	Chs. L. Eastman	M. W. Dickerman.	Concord, N. H.
Concord & Portsmouth	C. L. Eastman	M. W. Dickerman.	Concord, N. H.
Concord & Claremont	J. N. Lander	A. Langmaid	Concord, N. H.
Connecticut River	§Wm. H. Stearns.	R. Hitchcock	Springfield, Mass.
Connecticut Valley	C. W. Hollister	N. A. Smith	Hartford, Ct.
Connecticut Western	N. Slingland.		Hartford, Ct.
Contoocook River			Concord, N. H.
Conn. & Passumpsic Rivers	Geo. Kilby		Lyndonville, Vt.
Corning, Cowanesque & Antrim	O. C. Patchell	O. C. Patchell.	Corning, N. Y.
Cumberland Valley	A. S. Hull	C. W. Nitterhouse.	Chambersburg, Pa.
Cumberland & Pennsylvania	W. L. Jordan	Nathan Binnix	Mt. Savage, Md.
D			
Dakota Southern	Jas. Whitney	A. A. Meckling	Yankton, Dak.
Danbury & Norwalk	Charles A. Craig.	C. A. Craig	Danbury, Ct.
Davenport & St. Paul	James Russell		Davenport, Iowa.
Dayton & Union	H. S. Gordon	J. F. Feicht	Dayton, Ohio.
Dayton & Michigan	John Black	W. H. H. Allison	Cincinnati, Ohio.
Delaware, Lackawanna & Western	Walter Dawson	Robert McKenna	Scranton, Pa.
Morris & Essex Division	W. H. Lewis	L. S. Barber	Hoboken, N. J.
Denver & Rio Grande	John Greenwood		Denver, Col.
Detroit, Ft. Wayne & Logansport	W. A. Carpenter		Bankers, Mich.
Detroit & Milwaukee	C. M. Hanson		Detroit, Mich.
Detroit, Lansing & Lake Michigan	Tho. E. Roberts		Ionia, Mich.
Delaware & Hudson Canal Co.	‖‖R. C. Blackall		Albany, N. Y.
Dorchester & Delaware			Cambridge, Md.
Dubuque South-Western	James Rollo	James Rollo	Farley, Iowa.
Dutchess & Columbia	W. G. Vanbuskirk	H. A. Webster	Fishkill, N. Y.
Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett	Dunkirk, N. Y.
E			
Eastern		J. P. Somerby.	Salem, Mass.
Eastern	John Thompson		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L. Weaver	Riverton, Ky.
East-Tennesee, Virginia & Georgia	C. A. Hodge		Knoxville, Tenn.
Erie Railway	§§Frank K. Hain		Susquehanna, Pa.
Erie Railway	Robert Wallace		Susquehanna, Pa.
Erie Railway	V. Blackburn		Jersey City, N. J.
Erie Railway	F. M. Wilder	M. Wilder	Buffalo, N. Y.
Erie Railway	J. W. Chapman	J. W. Chapman	Hornellsville, N. Y
Erie Railway		‖D. B. Goodell	Elmira, NY.
Erie Railway		‖J. B. Hill	Jersey City N. J.
Erie Railway	J. Van Vechten	‖J. Van Vechten	Port Jervis, N. Y.
Erie Railway	A. T. Back		Rochester, N. Y.
Erie & Pittsburg	—G. J. Parkin.	G. J. Parkin	Erie, Pa.
European & North Am. (of Maine)	A. O. Bailey	J. H. Brown	Oldtown, Maine.
Evansville & Crawfordsville	John L. White	Joseph Stiker	Evansville, Ind.
Evansville, Terre Haute & Chicago	§§Beriah Warren		Terre Haute, Ind.
F			
Fitchburg	Geo. A. Cooledge.	Enos Varney	Charlestown, Mass.
Vermont & Mass. Div.	W. A. Foster	Jacob Marsh	Fitchburg, Mass.
Fitchburg & Worcester	John Webster	Samuel Stevens.	Fitchburg, Mass.
Flint & Pere Marquette	T. J. Halswell	‖R. B. More	East-Saginaw, Mich.
Florida	Ezra Gray	G. Hernandez	Fernandina, Fla.
Flushing & North Shore	Wm. La Suer	C. Wilkinson	Hunter's Point, L. I.
Fort Wayne, Jackson & Saginaw		Lewis Colburn	Jackson, Mich.
G			
Galveston, Harrisburg & San Antonio	S. W. Tozer.		Harrisburg, Texas.
Galveston, Houston & Henderson	Jno. G. Coulon	Jno. G. Coulon	Galveston, Texas.
Georgia	William Hardman.	T. M. Preval,	Augusta, Ga.
Gilman, Clinton & Springfield	W. B. McKenna		Clinton, Ill.
Grand Tower & Carbondale.	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk		Warren Noyes	Gorham, Me.
Grand Trunk	†Herbert Wallis	Wm. McWood	Montreal, Canada.
Grand Trunk.			Sherbrooke, Can.
Grand Trunk		B. J. Mitchell	Portland, Me.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne, Ind.
Great Western of Canada	†John Ortton	F. Childs	Hamilton, Canada.
Green Bay & Lake Pepin.	J. H. Erwin.		Green Bay, Wis.
Greenville & Columbia	R. H. Anderson	R. H. Anderson	Helena, S. C.
H			
Hackensack & New-York.	Abra'm Angausen		Hackensack, N. J.
Hanover Branch	John J. Bingley	Henry Britcher	Hanover, Pa.
Hannibal & St. Joseph	**Jno. MacKenzie	J. Townsend	Hannibal, Mo.
Hartford, Providence & Fishkill	Edwin Garfield	V. D. Perry	Hartford, Ct.
Housatonic	C. R. Morris.	J. J. Ferris	Falls Village, Ct.
Houston & Texas Central	L. C. Noble	James McGee	Houston, Texas.
Huntington & Broad-Top Mountain	W. W. Coller	M. Tellerhoof	Saxton, Pa.
I			
Illinois Central	**S. J. Hayes	W. B. Snow	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia, Ill.
North Division	J. B. Edams		Amboy, Ill.
Iowa Division	Thomas W. Place		Waterloo, Iowa.
Illinois Midland	J. G. Clifford	G. Clifford	Paris, Ill.
Illinois & St. Louis.	James Hazen		Bellville, Ill.
Indianapolis, Cincinnati & Lafayette	J. S. Patterson	S. Griffith	Cincinnati, Ohio.
Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Indianapolis & St. Louis	A. J. Sanborn		Mattoon, Ill.
Indianapolis, Bloomington & Western	**H. L. Cooper	A. J. Allen	Urbana, Ill.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ind.
International & Great Northern	R. B. Small		Palestine, Texas.
Intercolonial	Wm. Whitney	Edw. Shaffer.	Moncton, N. B.
Iron	Perry Scott	Clem. Roetling	Ironton, Ohio.
Ithaca & Athens	F. A. Brown.		Ithaca, N. Y.
J			
Jacksonville, Pensacola & Mobile	H. D. Kennedy		Jacksonville, Fla.
Jeffersonville, Madison & Indiana	Reuben Wells.		Jeffersonville, Ind.
Junction & Breakwater	J. A. Maguire.		Lewes, Del.
K			
Kalamazoo, Allegan & Grand Rapids			Kalamazoo, Mich.
Kansas City, St. Joseph & Council Bluff	Wm. D. Rowley	Wm. D. Rowley	St. Joseph, Mo.
Kansas Central	John Davis		Leavenworth, Kan.
Kansas Pacific	**L. H. Waugh	T. B. Roberts	Wyandotte, Kansas.
Denver Pacific Div	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div.	**L. H. Waugh		Wyandotte, Kansas.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Junction City & Ft. Kearney Div	**L. H. Waugh		Wyandotte, Kansas.
Arkansas Valley Div	**L. H. Waugh		Wyandotte, Kansas.
Kentucky Central	J. R. Ledyard	J. L. Hackathorn.	Covington, Ky.
Keokuk & Des Moines Valley	S. W. Wakefield	M. Sessions	Keokuk, Iowa.
King's Mountain	E. Thomas	E. Thomas	Chester, S. C.
Knox & Lincoln	§§E. R. Hamlin	Benj. Soule	Bath, Me.
Knoxville & Charleston			Knoxville, Tenn.
L			
Lackawanna & Bloomsburg	Chas. Graham	Chas. Graham	Kingston, Pa.
Lake Erie & Louisville	John Pero		Fremont, Ohio.
Lake Ontario Shore	Wm. Harris		Oswego, N. Y.
Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland, Ohio
Michigan Southern Division	Geo. W. Stevens		Elkhart, Ind.
" " "		S. S. Knapp	Adrian, Mich.
Toledo Division	J. M. Sanborn	Frank O. Bray	Norwalk, Ohio.
Erie Division	L. O. Gassett	J. Withyecombe.	Cleveland Ohio.
Buffalo Division	W. L. Wallace	A. C. Robson	Buffalo, N. Y.
Lake Superior & Mississippi	S. W. Leslie	John Hill	St. Paul, Minn.
Lehigh Valley	John I. Kinsey	E. R. Brown	South-Easton, Pa.
Lehigh Valley	P. Hofecker		Weatherly, Pa.
Lehigh Valley	John Campbell	Mauch Chunk, Pa.	Delano, Pa.
Lehigh Valley	D. Clark		Hazleton. Pa.
Leavenworth, Lawrence & Gal	J. S. McCrum		Ottawa, Kansas
Little Rock & Fort Smith	James Eblin	D. R. Wing	Argenta, Ark.
London & Port Stanley			London, C. W.
Louisville, New-Albany & Chicago	Geo. Ruhlandt	Geo. Helfrich	New-Albany, Ind.
Long Island	Chs. A. Thompson	C. A. Thompson	Hunter's Point, L I.
Louisville, Cincinnati & Lexington	S. S. Pilson	S. S. Pilson	Louisville Ky.
Louisville & Nashville	†Thatcher Perkins	Isaac M. Owens	Louisville, Ky.
Louisville Division	D. P. Rennie		Louisville, Ky.
Clarksville Division	Jas. Montgomery		Bowling Green, Ky.
Nashville & Decatur Division	W. J. Steele		Nashville, Tenn.
South & North Ala. Div	C. E. Slade	W. L. Gude	Birmingham, Ala.
Memphis & Ohio Div	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Louisville, Paducah & So. Western	W. D. Robb	Frank Looney.	Elizabethtown, Ky
M			
Macon & Augusta			Macon, Ga.
Macon & Brunswick	R. Wagnon	R. Wagnon	Macon, Ga.
Macon & Western	D. M. Gogel	James A. Knight.	Macon, Ga
Maine Central	J. W. Philbrick	J. W. Philbrick.	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div	John Ellis	C. H. Kenison	Augusta, Me.
Maine Central Division	John F. Merrill.		Waterville Me.
Manchester & Lawrence	Chas. L. Eastman.	M. W. Dickerman.	Concord, N. H.
Marietta, Pittsburg & Cleveland	W. J. Adams		Marietta, Ohio.
Marietta & Cincinnati	E. M. Bosley	E. M. Bosley	Chillicothe, Ohio
Marquette, Houghton & Ontonagon	C. J. Shellhorn	H. D. Lyons	Marquette, Mich.
Maryland & Delaware	Samuel Peters		Greensboro, Md.
Memphis & Little Rock	Tho. Rennell	P. Twitchell	Argenta, Ark
Memphis & Charleston	A. Ross	A W Drew	Memphis, Tenn.
Memphis & Charleston	H. N. Burford	Fabien Varin	Huntsville, Ala.
Mineral Point	Robert Hay	Robert Hay	Mineral Point. Wis.
Mineral Range	Geo. F. Coon		Hancock, Mich.
Mississippi & Tennessee	Geo. Haszinger	J. Riny	Memphis, Tenn.
Michigan Central	§§Geo. S. Chalender.	Geo. S. Chalender	Jackson, Mich.
Michigan Central		‖Henry Whiting	Detroit, Mich.
Midland Pacific	A. C. Stiles		Lincoln, Neb
Missouri, Iowa & Nebraska	J. G. Crozier		Alexandria, Mo.
Missouri, Kansas & Texas	Wm. Small		Parsons, Kan.
Missouri, Kansas & Texas	§§G. W. Cushing	John C. Barber	Sedalia, Mo.
Missouri, Kansas & Texas	J. E. Wiggins		Hannibal, Mo.
Missouri River, Fort Scott & Gulf	John S. McCrum	Alex. Montier	Kansas City, Mo
Mobile & Montgomery	James McFarland.	L. Barham	Montgomery, Ala.
Mobile & Girard	C. D. Wall		Girard, Ala.
Mobile & Ohio		John McHugh	Mobile, Ala.
Mobile & Ohio	R. McDougal	I. T. Booth	Whistler, Ala.
Mobile & Ohio	B. S. Herring		Macon, Miss.
Mobile & Ohio	R. H. Briggs		Jackson, Tenn.
Montgomery & Eufaula	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Algiers, La.
Montreal Northern Colonization	§§C. G. C. Simpson		Montreal, Can.
N			
Nashville & Chattanooga	John U. Eastman.	J. G. Sawyer	Nashville, Tenn.
Naugatuck	Henry Hanford	George W. Gray.	Bridgeport, Ct.
New-Bedford	G. W. Reynolds.	John L. Gibbs	New-Bedford, Mass.
New-Brunswick	P. Logan	C. M. Kinnon.	Fredericton, N. B.
New-Brunswick & Canada	Tho. Armstrong	G. Houlton	St. Andrew's, N. B
New-Haven & Northampton	Henry Fox.	Henry Fox.	New-Haven, Ct.
New-Jersey Midland	Duane Searle		Wortendyke, N J.
New-Jersey & New-York	A. J. Auryansen		Jersey City, N. J.
New-Jersey Southern	Rufus Blodgett.		Manchester, N. J.
New-Orleans, St. Louis & Chicago	‡‡——. Allen.		McComb City, Miss.
New-Orleans, St. Louis & Chicago	§§L. H. Sellars		Water Valley, Miss.
New-Orleans, St. Louis & Chicago		G. H. White	McComb City, Miss.
New-Orleans & Mobile	§Josiah Bettis	W. J. Henderson.	Mobile, Ala.
New-York, Kingston & Syracuse	A. Q. Mackenbush.	G. Dikeman	Syracuse, N. Y.
New-York & Harlem	Wm. M. Strong	C. E. Garey	New-York.
New-York Central & Hudson River		††Leander Garey.	New-York.
New-York Central Division	‡G. B. Van Vorst.	D. Hoit	West-Albany, N. Y.
New-York Central Division	Henry Watkeys.		Syracuse, N. Y.
New-York Central Division	Amos Gould	James Leary.	Rochester, N. Y.
New-York Central Division	Jas. Butman	Wm. Johnson	Buffalo, N. Y.
New-York Central Division	S. L. White.	George Rowe	Niagara Falls, N. Y.
Hudson River Division	‡Wm. Buchanan.	E. A. Olmstead.	New-York City.
Hudson River Division	R. Greenalch	J. J. Conaghty	E. Albany. N. Y.
New-York, Boston & Montreal	W. G. Van Buskirk	H. A. Webster	Dutchess Junc., N Y.
New-York & Oswego Midland	§§W. A. Dripps		Oswego, N. Y.
Eastern Division	J. Minchell		Middletown, N. Y.
Middle Division	Tho. Howard		Norwich, N. Y.
Northern Division	Edward Van Vleck.	T. D. Day	Oswego, N. Y.
New-York & New-England	Geo. E. Boyden	Elias E. Pratt	Boston, Mass.
New-York, Providence & Boston	Jas. H. Anderson.	Jas. H. Anderson.	Providence, R. I.
New-York, New-Haven & Hartford	§§H. Kittendorf	James Denver	New-Haven, Ct.
New-York, New-Haven & Hartford	E. S. Brewer	F. Leppens	Hartford, Ct.
Northern Central	G. W. Rhodes		Baltimore, Md.
Northern Central	James Strode	G. W. Demarest.	York, Pa.
Northern New-Hampshire	James W. Lander.	Albert Langmaid.	Concord, N. H.
Northern of Canada	P. Clark.	P. Clark	Toronto, Can.
Northern Pacific	**H. A. Towne		Brainerd, Minn.
Minnesota Division	W. H. Lewis		Brainerd, Minn.
Dakota Division	C. W. Rossiter		Fargo, D. T.
Pacific Division	J. F. Curtis		Kalama, W. T.
North-Carolina	Rufus D. Wade	B. G. Sergeant	Co. Shops, N. C.
North-Louisiana & Texas	C. H. Tull		Monroe. La.
North-Pennsylvania	Franklin Roop	Franklin Roop	Philadelphia, Pa.
North-Eastern	D. W. Haines	A. M. Corrie	Florence, S. C.
Norwich & Worcester	Richard Colburn	G. R. Bentley	Norwich, Ct.
O			
Ohio & Mississippi		G. Hibbert	Cochran, Ind.
Ohio & Mississippi	‡J. D. W. Potts		Seymour, Ind.
Oil City & Pithole	George Thompson		Pithole, Pa.
Oil Creek & Alleghany River	H. J. Bookhammer.	John Monks	Oil City, Pa.
Old Colony & Newport	J. K. Taylor	A. Gleason	Boston, Mass.
Oregon & California	§§J. Brandt.		Portland, Oregon.
Owensburg & Russellville	J. R. Osborne		Owensburg, Ky.
P			
Paducah & Memphis	J. S. Mackay		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Panama	Chas. E. Stewart		Aspinwall, N. G.
Pacific of Missouri	§§John Hewitt	J. Hodge	St Louis, Mo.
Pennsylvania	§§T. N. Ely		Altoona, Pa.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Pennsylvania	H. D. Garrett	I. W. Van Houten.	W. Philadelphia, Pa.
Pennsylvania	E. L Caum	Samuel W. Myers	Harrisburg, Pa
Pennsylvania	G. W. Strattan	John P. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver.	R. S. Ramsey	Pittsburg, Pa.
New-Jersey Division	L. A. Bosdevex		Meadow Shops, N. J.
New-Jersey Division		David H. Baker.	Jersey City, N. J.
West-Penn. Division	C. B. Street	M. H. Fales	Blairsville, Pa.
Peoria & Rock Island	Geo. Gregg		Peoria, Ill.
Peoria, Pekin & Jacksonville	R. F. Hurd	R. F. Hurd.	Pekin, Ill.
Petersburg & Weldon	R. B. Andrews	Alex. Wright	Petersburg, Va.
Philadelphia, Wilmington & Baltimore	S. A. Hodgman.	Wm. Lundgren	Wilmington, Del
Philadelphia & Baltimore Central	S. D. Danfield.	Samuel D. Danfield.	Chester, Pa.
Philadelphia and Erie	Martin Walls		Sunbury, Pa.
	W. L. Forster		Renovo, Pa.
	W. L. Holman		Kane, Pa.
	W. T. Smith.		Erie, Pa.
	§§Howard Fry		Erie, Pa.
Philadelphia & Reading	L. B. Paxson	Aaron Steinbach.	Reading, Pa.
Germantown & Norris'n Div.	Jackson Richards		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis		‖D. F. Andregg	Dennison, Ohio.
Pittsburg & Columbus Division	Ross Kells	Thos. D. Furgusen.	Steubenville, Ohio.
Little Miami Division		M. P. Ford	Columbus, Ohio
Little Miami Division	J. H. Setchel	John McVay	Cincinnati. Ohio.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlin.	Columbus, Ohio.
Col., Cin. & Ind. Division	Geo. H. Prescott.	Geo. H. Prescott.	Logansport, Ind.
Pittsburg, Fort Wayne & Chicago	S. M. Cummings.	John Marquis	Allegheny, Pa.
Pittsburg, Fort Wayne & Chicago	J. M. Boon.	Israel Lee	Fort Wayne, Ind
Pittsburg, Fort Wayne & Chicago		J. J. Kirkland	Crestline, Ohio.
Pittsburg, Virginia & Charlston	W. Lininger		Pittsburg, Pa.
Pittsburg, Washington & Baltimore	§Wm. Stearns		Connellsville, Pa.
Pittsburg, Washington & Baltimore	J. E. Sampsel	J. M. Leach	Pittsburg, Pa.
Portland & Rochester	John G. Brady	John G. Brady	Portland, Me.
Portland & Oxford Central	Geo. W. Battles.	Geo. W. Battles.	Buckfield, Me.
Portland, Saco & Portsmouth	John Donnell		Portland, Me.
Port Royal	Geo. Riley	J. H. Milton	Augusta, Ga.
Port Hope, Lindsay & Beaverton	H. G Taylor	H. G. Taylor	Port Hope, Can.
Portsmouth, Gt. Falls & Monmouth	James Tucker	E. Fall	Union Village, N.H.
Poughkeepsie & Eastern	John L Driscoll.	Jerry Wigg	Poughkeepsie, N. Y.
Providence & Worcester	Joseph Kelly	Olney L. Smith	Providence, R. I.
Providence, Warren & Bristol	Rufus Smith	J. Brightman	Bristol, R. I.
Q			
Quincy, Alton & St. Louis	J. O. Gravell	W. G. Gilbert	Quincy, Ill.
Quincy, Missouri & Pacific	W. F. Smith	W. F. Smith	Kirksville, Mo.
R			
Raleigh & Gaston	B. R. Harding	B. R. Harding	Raleigh, N. C.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Richmond, Fredericksburg & Potomac	H. Kuhn	W. H. Trainham	Richmond, Va
Richmond, Danville & Piedmont		J. B. Vaughan	Richmond, Va.
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond. Va.
Richmond & York River	C. H. Harris	J. L. Thompson	Richmond, Va.
Rive De Loup	P. A. Logan	C. R. McKinnin	Fredericton, N. B.
Rome, Watertown & Ogdensburg	Abram Klohs	H. H. Sessions	Rome, N. Y.
Rome, Georgia	O. W. Harbin	O. W. Harbin	Rome, Ga.
Rochester & Genesee Valley	M. E. Brown	M. Wilder	Buffalo, N. Y.
Rockford, Rock Island & St. Louis	Joseph Elder.	T. F. Nolte	Beardstown, Ill.
S			
Saginaw Valley & St. Louis	W. S. Thompson		Saginaw, Mich.
San Antonio & Mexican Gulf	W. T. Bingham		Victoria, Texas.
Savannah & Charleston	P. J. Hutson	J. D. Murphy	Charleston, S. C.
Seaboard & Roanoke	§§M. M. Pendleton		Portsmouth, Va.
Selma & Gulf	Wm. T. Daughtrey		Selma, Ala.
Selma, Rome & Dalton		W. W. Peirce	Selma, Ala.
Selma, Marion & Memphis	Dolphus Gay		Marion, Ala.
Sheboygan & Fond du Lac	John Hickey	John Hickey	Sheboygan. Wis
Sioux City & Pacific	C. H. Foster		Missouri Val., Iowa.
Southern Pacific of California	J. P. Wilson	F. N. Bellisle	San Francisco. Cal.
South-Carolina	W. B. Smith	John Reed	Charleston, S. C.
Southern Central	Chas. G. Brown	H. Mooney	Auburn, N. Y.
Southern, of Long Island	Mark Brear	C. Wilkinson	Brooklyn, N. Y.
Southern Minnesota	§§J. B. Henney.		Hokah, Minn.
South-Western of Georgia	C. D. Wall		Columbus, Ga.
South-Western of Georgia	D. M. Gogel	James A. Knight.	Macon, Ga.
South Side of Long Island	A. P. Doane	A. P. Doane	Williamsburg, L.
Spartanburg & Union	J. N. Benner	Jacob Rice	Union C. H., S. C
Springfield, Athol & Northeastern	W. E. Granger		Springfield, Mass.
Stanstead, Shefford & Chambly	W. H. Smith		Waterloo, C. E.
Stockton & Ione		W. T. Hoyt	Stockton, Cal.
Stonington & Providence	J. H. Anderson.	J. H. Anderson.	Providence. R. I.
St. Croix & Penobscot	Edward Bolton	A G. Page	Milltown, Me.
St. Joseph & Denver City	E. Sleppy		St. Joseph, Mo.
St. Lawrence & Ottawa	Calvin Dame.	Calvin Dame.	Prescott, Canada.
St. Louis, Iron Mountain & Southern	O. A. Haynes	Oscar Doolittle.	Carondelet, Mo.
Arkansas Division	L. Finlay	L. Finlay.	Little Rock, Ark.
St. Louis, Vandalia, T. Haute & Ind.	§§C. R. Peddle	E. D. Carter	Terre Haute, Ind.
Indianapolis Division	Wm. Riley		Terre Haute, Ind.
Vandalia Division	Chas. Butler.		Effingham, Ind.
St. Louis, Alton & Terre Haute	**Beriah Warren		St. Louis, Mo.
St. Louis, Salem & Little Rock	Thos. Everson		Steelville, Mo.
St. Louis & South-Eastern	‖‖L. B. Salisbury		Mt. Vernon, Ill.
Nashville Division	‖E. M. Hamstone		Edgefield, Tenn.
St. Paul & Pacific	J. C. Monroe	T. W. Heathcote	St. Paul, Minn.
St. Paul & Sioux City	F. C. Butterfield	J. W. Lydic	Shakopee, Minn.
St. Louis, Kansas City & Northern	W. H. Selby	C. S. Buck	Moberly, Mo.
St. Louis, Keokuk & Northwestern	Chas. Humphreys		Canton, Mo.
St. Louis, Lawrence & Western	J. A. Hagan		Lawrence, Kan.
Sullivan & Erie			Tonawanda, Pa.
Syracuse, Binghamton & New-York	H. H. Dawson	David Burling	Syracuse, N. Y.
Syracuse Northern	W. Garrison	L. W. Smith	Syracuse, N..
T			
Tennessee & Pacific	William McKeand.	William McKeand.	Nashville, Tenn.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	J. A. Hanglin		Marshall, Texas
Tioga	Peres Bonny	D. H. Stratton	Blossburg, Pa
Toledo, Peoria & Warsaw	W. O. Hewitt	R. M. Hemphill	Peoria, Ill.
Toledo, Wabash & Western	§J. B. Morse		Fort Wayne, Ind
Toledo, Wabash & Western	‖John C. Wills.		Lafayette, Ind.
Toledo, Wabash & Western	Jacob Johann		Springfield, Ill.
Toledo, Wabash & Western		U. H. Kohler	Toledo, Ohio.
Toronto, Grey & Bruce	Wm. Bowstead		Toronto, Can
Toronto & Nipissing	J. Haggus		Toronto, Canada.
Troy & Boston	Foster Church	R. V. Coon	Troy, N. Y.
U			
Union Pacific	§I. H. Congdon	‡‡Geo. E. Stevens	Omaha, Nebraska.
Eastern Division		‖A. M. Collett	Omaha, Neb.
Eastern Division		‖H. P. Makely	Grand Island, Neb.
Mountain Divison		‖Jno. E. Davis	Cheyenne, W. T.
Laramie Division		‖Floyd Heavaner	Laramie, W. T.
Western Division		‖C. A. Phipps	Evanston, U. T.
Utah Central	Thos. Pierpont	Thos. Pierpont	Salt Lake City.
Utica & Black River	John Bailey	David James	Utica, N. Y.
Utica, Chenango & Susquehanna	C. H. Brown		Utica, N. Y.
V			
Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.
Virginia & Truckee	Wm. Bowker		Carson, Nev.
W			
Wash. City, Va. Midland & Gr. Southern	Jas. E. Waddey	J. T. Nalls	Alexandria, Va.
Washington & Ohio	Edward Dunn	Joshua Harrison	Alexandria. Va
Welland	James Taylor	James Chase	St. Catharine, C. W.
Westchester & Philadelphia	John Moyer	N. Pawling	Philadelphia, Pa.
Western & Atlantic	John H. Flynn	Wm. Grambling	Atlanta, Ga.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Western Maryland	Wm. Lannan	J. H. Nussear	Union Bridge, Md.
Western North-Carolina	J. D. Hollister	J. D. Hollister	Salisbury, N. C.
Western of Alabama	John McVey	F. M. Wade	Montgomery, Ala.
Western R. R. N. C	M. W. Atkinson	M. W. Atkinson	Fayetteville, N. C.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
West-Feliciana	J. A. Tilton	Wm. McKelvey	Woodville, Miss.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
West-Wisconsin	Matt Ellis	J. C. Fischer	Hudson, Wis.
White Water Valley	A. W. Britton		Harrison, Ohio.
Wilmington, Columbia & Augusta	W. H. Turrintine		Wilmington, N. C.
Wilmington & Weldon	John Bissit	C. R. Clowe	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Winona & St. Peter	F. C. Ford	F. C. Ford	Winona, Minn.
Wisconsin Central	G. Campbell	J. L. Adams	Stevens' P't, Wis.
Worcester & Nashua	Albert Griggs.	Albert Griggs	Worcester, Mass
Wyandotte, Kansas City & N. Western.	W. W. Brownhill		Independence, Mo.

DIRECTORY
OF
Railway Superintendents and Purchasing Agents
THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director. ‡ Ass't. Gen. Supt. § Ass't Supt.

A

Railroad.	*Superintendent.*	*Purchasing Agent*	*Residence.*
Adirondack	C. H. Ballard		Saratoga, N. Y.
Alabama Central	John M. Bridges		Selma, Ala.
Albany & Susquehanna	*C. F. Young		Honesdale, Pa.
Allegheny Valley	David McCargo	John L. Awl	Pittsburg, Pa.
Arkansas Central	James A. Tappan		Helena, Ark.
Atchison, Topeka & Santa Fe	C. F. Morse	C. F. Morse	Topeka, Kansas.
Atchison & Nebraska	L. W. Towne		Atchison, Kan.
Atchison & Nebraska	*Geo. H. Nettleton		Kansas City, Mo.
Alabama & Chattanooga	C. H. Stanton	T. J. Carlile	Meridan, Miss.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Ashtabula, Ohio.
Atlanta & Richmond Air Line	L. P. Grant, *Rec.*		Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines.		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	J. H. Holway	Meadville, Pa.
First Division	J. T. Odell		Meadville, Pa.
Second Division	A. L. Dunbar		Meadville, Pa.
Third and Fourth Division	T. A. Phillips		Galion, Ohio.
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage.	C. W. Rogers	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.

B

Baltimore & Ohio	Thos. R. Sharp	Benj. Williams	Baltimore, Md.
Ohio & Chicago Divisions	W. C. Quincy		Columbus, Ohio.
Baltimore & Potomac	Geo. C. Wilkins	A. W. Sumner	Baltimore, Md.
Bangor & Piscataquis	M. H. Angel	L. H Eaton	Bangor, Maine.
Boston, Barre & Gardner	I. N. Ross		Worcester, Mass.
Boston & Albany	*Wm. Bliss.		Boston, Mass
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & Providence	A. A. Folsom	A. A. Folsom	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood	Chas. Brigham	Fitchburg, Mass.
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A. Dodge	Lyon & Vose	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood	Boston, Mass.
Boston, Lowell & Nashua	W. M. Parker	F. H. Nourse	Boston, Mass.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Brunswick & Albany	C. L. Schlatter		Brunswick, Ga.
Burlington & Missouri River (in Neb.)	Wm. Irving		Omaha, Neb.
Burlington, Cedar Rapids & Minnesota	*E. F. Winslow		Cedar Rapids, Ia
Burlington, Cedar Rapids & Minnesota		A. G Thompson	St. Louis, Mo.
Burlington & South-Western	R. T. Hosford	O. W. Owen	Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo Corry & Pittsburg	David McCargo	N. M. Whitside	Pittsburg, Pa.

C

Cairo & St. Louis	J. L. Hinkley	C. Ritsema	St. Louis, Mo.
Cairo & Vincennes	Henry L. Morrill		Cairo, Ill.
Camden & Atlantic	F. A. Lister	J. L. Wendell	Camden, N. J.
Canada Central, Brockville, & Ottawa	H. P. Alden		Brockville, Can.
Canada Southern	*W. K. Muir		St. Thomas, Ont.
Canada Southern	— Webster	E. W. Porter	St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua, Pa.
Cayuga Lake	J. L. Grant		Ithaca, N. Y.
Central Branch Union Pacific	W. F. Downs	W. F. Downs	Atchison, Kan.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Central Pacific	‡John Corning		Sacramento, Cal.
Western Division	E. C. Fellows		Lathrop, Cal.
Visalia Division	E. C. Fellows		Lathrop, Cal.
Truckee Division	Frank Free		Wadsworth, Nev.
Humboldt Division	R. S. Matteson		Carlin, Nevada.
Oregon Divison	J. A. Fillmore		Sacramento, Cal.
Sacramento Division	J. A. Fillmore		Sacramento, Cal.
Salt Lake Division	R. H. Pratt		Ogden, Utah.
California Pacific Division	A. D. Wilder		Vallejo, Cal.
Central Vermont	J. W. Hobart		St. Albans, Vt.
Western Division	John Schrier		Ogdensburg, N. Y.
Central & Southern Division	Ambrose Arnold		St. Albans, Vt.
Northern & Eastern Division	G. L. Stone		" " "
Rutland Division	J. Burdett		Rutland, Vt.
Harlem Extension Division	J. Burdett		Rutland, Vt.
New-London Northern	G. W. Bentley		New-London, Ct.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Atlanta Division	G. J. Foreacre		Alexandria, Va.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	W. M. S. Dunn	J. A. Netherland	Richmond, Va.
Eastern & Middle Division	J. L. Morrow.		Staunton, Va.
Western Division	J. E. Mallory		
Charlotte, Columbia & Augusta	James Anderson		Columbia, S. C.
Cheshire	R. Stewart	H. H. Stone	Keene, N. H.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt	R. W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	J. B. Mulliken		Escanaba, Mich.
Madison Division	C. A. Swineford.		Baraboo, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver		Clinton, Iowa.
Western Iowa Division	John A. Head		Boone, Iowa.
Chicago & Alton	J. C. McMullin	A. V. Hartwell	Chicago. Ill.
Chicago, Burlington & Quincy	R. Harris	D. B. Sibley	Chicago, Ill.
Chicago Burlington & Quincy	‡C. H. Hudson		Chicago, Ill.
Eastern and Middle Division			Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division.	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota.	C. Harris	F. I. Massey	Dubuque, Iowa
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	*Geo. S. Bowen.	James Penny	Chicago, Ill.
Chicago & Pacific	J. M. Whitman		Chicago, Ill..
Chicago & Paducah			Streator, Ill.
Chicago, Rock Island & Pacific.	Hugh Riddle.	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chicago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Chicago & Michigan Lake Shore	*Geo. C. Kimball	Wm. R. Morrison	St. Joseph, Mich.
Chicago, Danville & Vincennes	L. Pearson	J. L. Yale	Chicago, Ill.
Chicago, Milwaukee & St. Paul	*S. S. Merrill	J. T. Crocker	Milwaukee, Wis.
Chicago, Pekin & Southwestern	W. P. Sisson		Streator, Ill.
Chicago & Canada Southern	D. Edwards		Toledo, Ohio.
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.
Cincinnati, Richmond & Chicago	Lewis Williams		Cincinnati, Ohio
Cincinnati & Martinsville	T. C. Burnside		Franklin, Ind.
Cin., Cumberland Gap & Charleston	W. J. Taylor		Knoxville, Tenn.
Cincinnati Hamilton & Dayton	Lewis Williams	P. Hickey	Cincinnati, Ohio.
Cincinnati, Hamilton & Indianapolis	Lewis Williams		Cincinnati, Ohio.
Cincinnati, Lafayette & Chicago	E. H. Waldron	G. G. Hadley	Lafayette, Ind.
Cincinnati, Sandusky & Cleveland	*D. W. C. Brown		Sandusky, Ohio.
Cincinnati, Sandusky & Cleveland	Chas. Howard		Springfield, Ohio.
Cleveland, Columbus, Cincinnati & Ind.	E. S. Flint		Cleveland, Ohio.
Indianapolis Division	C. C. Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division.	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Cleveland, Mt. Vernon & Delaware.	G. A. Jones		Mt. Vernon, Ohio.
Cleveland, Tuscarawas Val. & Wheeling.	*E. B. Thomas	W. W. Card, *Supt*	Cleveland, Ohio.
Colorado Central	P. J. Nichols		Golden, Col.
Columbus & Hocking Valley	M. M Green.		Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H.E.Chamberlin.	H. E. Chamberlin.	Concord, N. H.
Connecticut River	John Mulligan	John Mulligan.	Springfield, Mass.
Connecticut & Passumpsic Rivers	H. E. Folsom	Geo. Killey	Lyndonville, Vt
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Corning, Cowanesque & Antrim	A. H. Gorton	R. J. Burnham	Corning, N. Y.
Cumberland Valley	J. F. Boyd	J. F. Boyd	Chambersburg, Pa.
Cumberland & Pennsylvania	J. A. Millholland		Mt. Savage, Md.

D

Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	J. R. Meckling	J. R. Meckling	Sioux City, Iowa.
Davenport & St. Paul	N. H. Wood		Davenport, Iowa.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware & Hudson Canal Co.	*C. F. Young		Honesdale, Pa.
Albany & Susq. Division	C. D. Hammond		Oneonta, N. Y.
Rensselaer & Saratoga Div	Theo. Voorhees		Troy, N. Y.
Delaware, Lackawanna & Western		G.W. B. Cushing	New-York City.
Delaware, Lackawanna & Western	W. F. Hallstead.		Scranton, Pa.
Lack. & Bloomsburg Div.	D. T. Bound		Kingston, Pa.
Morris & Essex Division	Andrew Reasmer		Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus. Division	W. F. Hallstead		Utica, N. Y.
Denver & Rio Grande	W. W. Borst	W. S. Jackson	Denver, Col.
Detroit and Milwaukee	S. R.Callaway	John S. Lorimer	Detroit, Mich.
Detroit, Hillsdale & Southwestern	W. F. Parker.		Ypsilanti, Mich.
Detroit, Eel River & Illinois	T. B. Sargeant		Logansport, Ind.
Detroit, Lansing & Lake Michigan	J. B. Mulliken	C. D. Childs	Detroit, Mich
Dorchester & Delaware	J. M. Murphy		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer	C. V. DeForest	Fredonia, N. Y.
Dubuque & South-Western	J. P. Farley		Dubuque, Iowa
Dutchess & Columbia	C. L. Kimball		Dutchess J'n, N. Y.

E

East Alabama & Cincinnati	B. Boyle		Opelika, Ala.
East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern	Geo. Bachelder	C. W. Pratt	Boston, Mass.
Erie & Pittsburg	J. M. Kimball		Erie, Pa
Erie Railway,	E. S. Bowen	C. H. Bowman	New-York City.
Erie	P. P. Wright		Jersey City, N. J.
Eastern Division	E. O. Hill		Port Jervis, N. Y.
Delaware Division	Benj. Thomas		Port Jervis, N. Y.
Rochester Division	M. E. Brown		Rochester, N. Y.
Susquehanna Div.	C. W. Gardner		Elmira, N. Y.
Buffalo Division	R. G. Taylor		Buffalo, N. Y.
Western Division	J. S. Beggs		Buffalo, N. Y.
Erie & Pittsburg	*J. D. Layng	Wm. Mullins	Pittsburg, Pa.
European & North-American	M. H. Angell	M. H. Angell	Bangor, Maine.
Evansville & Crawfordsville	John E. Martin		Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.

F

Fitchburg	Chas.L.Heywood.	John Adams	Boston, Mass.
Vermont & Mass. Div.	C. H. Comee		Fitchburg, Mass.
Flint & Pere Marquette	Sanford Keeler		East-Saginaw, Mich.
Flushing & North-Side	I. D. Barton		Hunter's Point, L. I.
Flushing & North-Side		A. E. Godeffroy	New-York City.
Fort Wayne, Jackson & Saginaw	D. W. Smith		Jackson, Mich.
Fort Wayne, Muncie & Cincinnati	W. W. Worthington		Fort Wayne, Ind.

G

Galveston, Harrisburg & San Antonio	Hardy Eddins	J. W. Pierce.	Galveston, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Geneva, Ithaca & Athens	R. A. Packer		Ithaca, N. Y.
Georgia	S. K. Johnson	John Vaughn	Augusta, Ga.
Gilman, Clinton & Springfield	T. J. Hudson		Springfield, Ill.
Grand Gulf & Port Gibson	G. W. McGinnis		Port Gibson, Miss,
Grand Rapids & Indiana.	Wm. O. Hughart		Grand Rapids, Mich.
S. Division	J. M. Matheany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich.
Grand Rapids & Indiana	*W. O. Hughart		Grand Rapids, Mich.
Grand Trunk	*J. Hickson	John Taylor	Montreal, Canada.
East Division	Henry Bailey		Montreal, Canada.
West Division	W. J. Spicer		Toronto, Canada.
Grand Tower and Carbondale	T. M. Williamson.	Wm. W. Harris.	Grand Tower, Ill.
Great Southern of Ga. & Fla	M. H. Alberger		Jacksonville, Fla.
Great Western (Canada)	Andrew Watson	Robert Beatty	Hamilton, Ont.
Green Bay & Minnesota	S. B. Kenrick		Green Bay, Wis.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.

H

Hannibal & St. Joseph	*R. S. Stevens	W. J. Hilton	Hannibal, Mo.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin	D. S. Draper	Bridgeport, Ct
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	C. A. Burton		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top.	Geo. F. Gage	B. A. Knight	Huntingdon, Pa.

I

Illinois Central	Jos. F.Tucker		Chicago, Ill.
Illinois Central.	*Jas. C. Clarke	O. Ott	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois Midland	R. G. Hervey	‡P. Campbell	Terre Haute, Ind.
Illinois & St. Louis	W. K. McComas		St. Louis, Mo.
Indianapolis, Bloomington & Western	C. C. Smith		Indianapolis, Ind.
Indianapolis, Bloomington & Western	Geo.B. Wright, Receiver.		Indianapolis, Ind.
Indianapolis, Cincinnati & Lafayette	Geo.L. Barringer	E. V. Cherry	Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna		Indianapolis, Ind.
Indianapolis & Vincennes		Wm. Mullins.	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward	J. W. Morse.	St. Louis, Mo.
Indianapolis, Peru & Chicago	E. C. Murphy	D. Macy.	Indianapolis, Ind.
Michigan City Division			La Porte, Ind.
Intercolonial Railway	Lewis Carvell	Sam. Watson	Moncton, N. B.
International & Great Northern	H. M. Hoxie		Palestine, Texas.

J

Jacksonville, North-Western & S. E.	E. S. Greenleaf		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	Robert Walker		Jacksonville, Fla
Jeffersonville, Madison & Indianapolis		Wm. Mullins	Pittsburg, Pa.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Jeffersonville, Madison & Indianapolis	*D. W. Caldwell		Columbus, Ohio.
Jefferson, Madison & Indianapolis,	Horace Scott		Louisville, Ky.
Junction & Breakwater	Tho. Groom		Lewes, Del.
K			
Kansas Central	W. R. Martin		Leavenworth, Kan.
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard	J. F. Barnard	St. Joseph, Mo.
Kansas City, St. Joseph & Council Bluffs	*Geo. H. Nettleton		Kansas City, Mo.
Kansas Midland	W. W. Fagan		Topeka, Kan.
Kansas Pacific	O. S. Lyford		Kansas City, Mo.
Kansas Pacific	O. S. Lyford	J. L. Woods	St. Louis, Mo.
Kaw Valley Division	O. H. Dorrance		Lawrence, Kan.
Smoky Hill Division	J. Loomis		Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col.
Kentucky Central	G. H. Pendleton	Geo P. Bowler	Covington, Ky.
Keokuk & Des Moines Valley	Geo. H. Griggs		Keokuk, Iowa.
Knox & Lincoln	C. A. Coombs	Oliver Morse	Bath, Maine.
L			
Lackawanna & Bloomsburg	D. T. Bound		Kingston, Pa.
Lake Erie & Louisville	I. H. Burgoon		Fremont, Ohio.
Lake Ontario Shore	E. A. Van Horne		Oswego, N. Y.
Lake Superior & Mississippi	G. H. Smith	C. F. Cruft	St. Paul, Minn.
Lake Shore & Michigan Southern	Charles Paine	A. C. Armstrong	Cleveland, Ohio.
Kalamazoo Division	William Wheaton		Kalamazoo, Mich.
Leavenworth, Lawrence & Galveston	B. S. Henning		Lawrence, Kan.
Leavenworth, Lawrence & Galveston	*Geo. H. Nettleton		Kansas City, Mo.
Lawrence & South-Western	R. B. Gemmell	R. B. Gemmell	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
Lehigh Valley		L. Chamberlin	Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa.
Mahony Division	James I. Blakslee		Mauch Chunk, Pa.
New-Jersey Division	H. E. Packer		Metuchen, N. J.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	T. Hartman		Little Rock, Ark.
Logansport, Crawfordsville & S. W.			Terre Haute, Ind.
Long Island	G. W. N. Custis		Hunter's Point, L. I.
Louisville & Nashville & G. Southern		G. C. Breed	Louisville, Ky.
Clarksville Division	Jas. Montgomery		Bowling Green, Ky.
Memphis Division	J. T. Flynn		Memphis, Tenn.
Nashville & Decatur Division	James Geddes		Nashville, Tenn.
So. & North Ala. Division	Robert Meek		Birmingham, Ala.
Louisville, Cin. & Lexington	J. McLeod	J. McLeod	Louisville, Ky.
Louisville, New-Albany & Chicago		J. R. Parker	New-Albany, Ind.
Louisville, Paducah & Southwestern	D. F. Whitcomb	D. F. Whitcomb	Louisville, Ky.
M			
Macon & Brunswick	John A. Grant		Macon, Ga.
Maine Central	Payson Tucker		Portland, Me.
Manchester & Lawrence	H. E. Chamberlin		Concord, N. H.
Marietta & Cincinnati	W. W. Peabody	S. L. Campbell	Cincinnati, Ohio.
Marietta, Pittsburg & Cleveland	Jas. McArthur	R. B. Hoover	Marietta, Ohio.
Marquette, Houghton & Ontonagon	*Samuel Schoch	Jas. S. Mott	Marquette, Mich.
Maryland & Delaware	J. L. Caldwell	J. L. Caldwell	Easton, Md.
Memphis, Carthage & North-Western	E. H. Brown		Carthage, Mo.
Memphis & Little Rock	W. E. Smith	W. E. Smith	Memphis, Tenn.
Memphis & Charleston	W. J. Ross		Memphis, Tenn.
Michigan Central	W. B. Strong		Chicago, Ill.
Michigan Central	‡J. R. Ledyard	Allan Bourn	Detroit, Mich.
Grand River Valley Division	C. B. Bush		Jackson, Mich.
Air-Line, So. Bend & Joliet	E. C. Brown		Jackson, Mich.
Bay City Division			Detroit, Mich.
Jackson, Lansing & Saginaw Div.	C. B. Bush		Jackson, Mich.
Mackinaw Division	T. B. Sargent		Bay City, Mich.
Michigan Lake Shore	D. P. Clay, *receiver*		Grand Rapids, Mich.
Midland Railway of Canada	H. G. Taylor		Port Hope, Ont.
Midland Pacific	J. N. Converse	M. A. Showers	Nebraska City, Neb.
Milwaukee, Lake Shore & Western	H. G. H. Reed		Milwaukee, Wis.
Mineral Point	G. W. Cobb	G. W. Cobb	Mineral Point, Wis.
Mineral Range	J. H. Macdonald		Hancock, Mich
Mississippi & Tennessee	M. Burke	M. Burke	Memphis, Tenn.
Missouri, Iowa & Nebraska	Col. Henry Hill		Warsaw, Ill.
Missouri, Kansas & Texas	A. B. Garner	G. M. Babcock	Sedalia, Mo.
Cherokee Division	L. H. Sheldon		Parsons, Kansas.
Choctaw Division	S. G. Eddy		Dennison, Texss.
Missouri Division	J. J. Frey		Sedalia, Mo.
Sedalia Division	J. J. Frey		Sedalia, Mo.
Neosho Division	L. H. Sheldon		Parsons, Kansas.
Osage Divsion	C. M. Sheafe		Holden, Mo.
Missouri Pacific	A. A. Talmage	C. W. Rogers	St. Louis, Mo.
Missouri River, Fort Scott & Gulf	B. S. Henning	A. H. Campbell	Kansas City, Mo.
Missouri River, Fort Scott & Gulf	*Geo. H. Nettleton		Kansas City, Mo.
Mobile & Ohio	*A. L. Rives		Mobile, Ala.
Alabama Division	J. S. Walker		Mobile, Ala.
Mississippi Division	E. S. Hosford		Macon, Miss.
Tenn. & Ky. Division	Cecil Fleming		Jackson, Tenn.
Mobile & Girard	W. L. Clark		Columbus, Ga.
Mobile & Montgomery	G. Jordon	G. Jordon	Montgomery, Ala.
Montgomery & Eufaula	B. Dunham	B. Dunham	Montgomery, Ala.
Morgan's Louisiana & Texas		C. A. Whitney & Co.	New-Orleans, La.
N			
Nashville, Chattanooga & St. Louis	J. W. Thomas		Nashville, Tenn.
Naugatuck	G. W. Beach		Bridgeport, Ct.
New-Brunswick & Canada	John Stewart		St. Stephens, N. B.
New-Bedford	*H. A. Blood		Fitchburg, Mass.
New-Haven & Derby	E. S. Quintard		New-Haven, Ct.
New-Haven & Northampton	C. N. Yeamans	C. N. Yeamans	New-Haven, Ct.
New-Haven, Middletown & Willimantic	W. A. Waterbury	W. A. Waterbury	Middletown, Ct
New-Jersey & New-York	W. D. Beasley		Jersey City, N. J.
New-Jersey Midland	W. E. Lewis	R. H. Chipman	Wortendyke, N. J.
New-Jersey Southern	*W. S. Sneden		Long Branch, N. J
New-Orleans & Selma	T. H. Du Puy		Selma, Ala.
New-Orleans, St. Louis & Chicago	*E. D. Frost	S. H. Edgar, V. P.	New-Orleans, La.
New-Orleans & Mobile	D. B. Robinson	John J. Howell	Mobile, Ala.
New-York & Harlem	Chas. M. Bissell	R. C. Moore	New-York, N. Y.
New-York, New-Haven & Hartford	E. M. Reed	R. N. Dowd	New Haven, Ct.
N. Y. & N. H. Division	John T. Moody		New-York, N. Y.
Hartford Division	C. S. Davidson		Hartford, Ct.
Shore Line Division	W. H. Stephenson		New-Haven, Ct.
New-York, Boston & Montreal	C. L. Kimball		Dutchess Jn., N. Y.
New-York Central & Hudson River	J. Tillinghast		Albany, N. Y.
Hudson River Division	J. M. Toucey	C. V. DeForest	New-York.
Eastern Division	Zenas C. Priest		Utica, N. Y.
Syracuse & Rochester Division	G. H. Burrows		Syracuse, N. Y.
New-York & New-England	H. M. Britton	W. W. McKim	Boston, Mass.
Worcester Division	P. St. M. Andrews		Worcester, Mass.
New-York & Oswego Midland			New-York, N. Y.
Middle Division	H. M. Flint		Middletown, N. Y.
Western Division			Oswego, N. Y.
New-York, Kingston & Syracuse	F. J. Hecker		Rondout, N. Y.
New-York, Providence & Boston	A. S. Matthews	A. S. Matthews	Stonington, Ct.
New Brunswick	Tho. Hoben	W. R. Logan	Fredericton, N.B.
Northern Pacific	*C. W. Mead	E. F. Williams	St. Paul, Minn.
Minnesota Division	J. H. Sullivan		Brainerd, Minn.
Northern Pacific Division	*J. W. Sprague		Kalama, W. T.
Lake Superior & Miss. Division	George H. Smith		St. Paul, Minn.
North-Pennsylvania	S. W. Roberts	F. A. Cornby	Philadelphia, Pa.
Northern Canada	†F. W. Cumberland		Toronto, Can.
North Carolina	A. B. Andrews		Comp' Shops, N. C.
Northern Central	*Frank Thomson	A. W. Sumner	Philadelphia, Pa.
Northern (New-Hampshire)	George E. Todd		Concord, N. H.
North-Eastern (South-Carolina)			Charleston, S. C.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
O			
Ohio & Mississippi	E. H. Waldron		St. Louis, Mo.
Oil Creek & Alleghany River	C. J. Hepburn		Pittsburg, Pa.
Old Colony	J. R. Kendrick		Boston, Mass.
Omaha & North-Western	J. E. House		Omaha, Neb.
Oregon & California	J. Brandt, Jr.		Portland, Oregon.
P			
Paducah & Memphis	J. W. Wilbur		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Paris & Danville	B. L. Baldwin		Danville, Ill.
Passumpsic	G. A. Merrill		Lyndonville, Vt.
Pennsylvania	G. Clinton Gardner		Altoona, Pa.
Pennsylvania	*Frank Thomson	Enoch Lewis	Philadelphia, Pa.
New-Jersey Division	F. Wolcott Jackson		Jersey City, N. J.
Philadelphia Division	W. F. Lockard		Philadelphia, Pa.
Middle Division	J. N. McCrea		Harrisburg, Pa.
Pittsburg Division	Rob't Pitcairn		Pittsburg, Pa.
Tyrone Division	S. S. Blair		Tyrone Pa.
Bedford Division	S. M. Prevost		Bedford, Pa.
West Pennsylvania Division	J. McC. Creighton		Allegheny City, Pa.
Pennsylvania & New-York Canal	A. Mitchell		Wilkesbarre, Pa.
Pensacola & Louisville	C. S. Williams		Pensacola, Fla.
Peoria & Rock Island	John R. Hilliard		Peoria, Ill.
Peoria & Rock Island	J. R. Hilliard, *Rec. and P. Agt.*		Peoria, Ill.
Peoria, Pekin & Jacksonville	John Allen	John Allen	Pekin, Ill.
Petersburg	H. F. Douglas	W. P. Taylor	Petersburg, Va
Philadelphia & Reading	J. E. Wootten	W. S. Wilson	Philadelphia, Pa.
Catawissa & Williamsport Br'ch	D. C. Reinhart		Williamsport, Pa.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Lebanon & Tremont	H. W. Tracy		Pine Grove, Pa.
Philadelphia and Baltimore Central	Henry Wood	Henry Wood	Philadelphia, Pa.
Philadelphia & Erie	W. A. Baldwin		Williamsport, Pa.
Philadelphia & Erie		Enoch Lewis	Philadelphia, Pa.
Western Division	J. W. Reynolds		Erie, Pa.
Middle Division	Edmund L. Tyler		Renovo, Pa.
Eastern Division	Thomas Gucker		Williamsport, Pa.
Philadelphia, Wilmington & Baltimore	H. F. Kenney		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis		Wm. Mullins	Pittsburg, Pa.
Pittsburg, Cincinnati & St. Louis	*D. C. Caldwell		Columbus, Ohio.
Eastern Division	J. H. Barrett		Pittsburg, Pa.
Little Miami Division	J. D. Ellison		Cincinnati, Ohio.
Western Division	Jas. R. Shaler		Dennison, Ohio.
Pittsburg, Washington & Baltimore	E. K. Hindman		Connellsville, Pa.
Pittsburg, Ft. Wayne & Chicago	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Eastern Division	George Webb		Pittsburg, Pa.
Western Division	C. D. Gorham		Fort Wayne, Ind.
Port Royal	R. G. Fleming		Augusta, Ga.
Portland & Ogdensburg	J. Hamilton	John E. Donnell	Portland, Maine.
Portland & Rochester	J. M. Lunt	W. H. Turner	Portland, Maine.
Portsmouth, Great Falls & Conway	J. W. Sanborn		Portsmouth, N. H.
Portsmouth	H. E. Chamberliu		Concord, N. H.
Poughkeepsie, Hartford & Boston	J. A. Perkins	A. W. Cable	Poughkeepsie, N. Y
Providence & Worcester	W. D. Hilton	W. D. Hilton	Providence, R. I.
Providence, Warre & Bristol	Waterman Stone		Providence, R. I.
Q			
Quincy, Alton & St. Louis	N. J. T. Dana	N. J. T. Dana	Quincy, Ill.
Quincy, Missouri & Pacific	J. R. Buchanan		Quincy, Ill.
R			
Raleigh & Gaston			Raleigh, N. C.
Richmond, York River & Chesapeake	H. T. Douglas	Hugh Graham	Richmond, Va.
Richmond & Danville	T. M. R. Talcott		Richmond, Va.
Richmond, Fred. & Potomac	E. T. D. Myers	T. L. Courtney	Richmond, Va.
Richmond & Petersburg	Augustus Shaw		Richmond, Va.
Rockford, Rock Island & St. Louis	W. H. Ferry, Receiver	A. E. Lyford	Rock Island, Ill.
Northern Division	Henry Looseley		Rock Island, Ill.
Southern Division	Geo. L. Walker		Beardstown, Ill.
Rome, Watertown & Ogdensburg	J. W. Moak		Watertown, N. Y.
S			
St. Lawrence & Ottawa	R. Luttreil		Prescott, Can.
St. Joseph & Denver City	*L. D. Tuthill		St. Joseph, Mo
St. Paul & Pacific	E. Q. Sewell	E. C. Becker	St. Paul, Minn
St. Paul & Sioux City	J. F. Lincoln	J. F. Lincoln	St. Paul, Minn.
St. Louis, Alton & Terre Haute	W. G. Broughton		St Louis, Mo.
St. Louis, Iron Mountain & Southern	Arthur W. Soper	W. S. Cuddy	St. Louis, Mo.
St. Louis, Iron Mountain & Southern	*A. W. Soper		St. Louis, Mo.
St. Louis & South-Eastern	R. H. G. Minty	A. G. Thompson	St. Louis, Mo.
St. Louis Division	George S. Winslow		Mt. Vernon, Ill.
Nashville Division			Henderson, Ky.
St. Louis, Kansas City & Northern	Jas. F. How	R. W. Green	St. Louis, Mo.
St Louis Division	W. H. Vaughan		St. Louis, Mo.
Western Division	C. L. Dunham		Kansas City, Mo.
St. Louis, Keokuk & Northwestern	Guy Wells		Keokuk, Ia.
St. Louis, Vandalia, Terre Haute & Ind	John E. Simpson	C. R. Peddle	Indianapolis, Ind.
St. Louis, Lawrence & Western	E. C. Devereaux		Lawrence, Kan.
St. Louis, Salem & Little Rock		H. A. Crawford	St. Louis, Mo.
St. Louis, Salem & Little Rock	J. W. Blanchard		Steelville, Mo.
Sacramento Valley & P. & S. V	F. A. Bishop		Sacramento, Cal.
Saginaw Valley & St. Louis	N. M. Merrill	N. M. Merrill	Saginaw, Mich.
San Francisco & Northern Pacific	A. A. Bean	F. H. Gudes	Petaluma Cal.
San Rafael & San Quentin	David Nye		San Rafael, Cal.
Savannah & Charleston	C. S. Gadsden		Charleston, S. C.
Seaboard & Roanoke		E. G. Ghio	Baltimore, Md.
Selma, Marion & Memphis	E. W. Rucker	E. W. Rucker	Marion, Ala.
Selma, Rome & Dalton	M. Stanton		Selma, Ala.
Sheboygan & Fond du Lac			Fond du Lac, Wis.
Shenango & Allegheny	I. T. Blair		Greenville, Pa.
Sioux City & Pacific	L. Burnett	L. Burnett	Missouri Valley, Ia.
Sodus Point & Southern	H. Van Vleck		Sodus Point, N. Y.
South-Shore	J. R. Kendrick		Boston, Mass.
South Carolina	S. S. Solomon	A. Mitchell	Charleston, S. C.
Southern Central	Jas. G. Knapp		Auburn, N. Y.
Southern, of Long Island	I. D. Barton		Hunter's Point, L. I
Southern, of Long Island		A. E. Godeffroy	New-York City.
Southern Minnesota	W. C. Van Horne		La Crosse, Wis.
Southern Pacific of California	A. N. Towne		Sacramento, Cal.
North Division	A. C. Bassett		San Francisco, Cal.
Los Angeles Division	E. E. Hewitt		San Francisco, Cal.
Southwestern of Georgia	Virgil Powers		Macon, Ga.
Spartanburg & Union	W. W. Davies		Spartanburg, S. C.
Springfield Athol & Northeastern	John W. Phelps		Springfield, Mass.
Springfield & North-Western	*A. J. Ware		Pekin, Ill.
Staten Island	J. W. Wilbur		New-York, N. Y.
Stockton & Ione	W. G. Miller		Stockton, Cal.
Stonington & Providence	A. S. Mathews	A. S. Mathews	Stonington, Ct.
Sullivan & Erie	Wm. Stevenson		Towanda, Pa.
Summit County	W. M. Riter		Coalville, Utah.
Syracuse Northern	J. W. Moak		Syracuse, N. Y
Syracuse, Binghamton & New-York	T. Voorhees		Syracuse, N. Y.
T			
Tennessee & Pacific	George Maney		Nashville, Tenn.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	Geo. H. Noble		Marshall, Texas.
Tioga	L. H. Shattuck		Blossburg, Pa.
Toledo, Peoria and Warsaw	A. L. Hopkins, *Receiver*		Peoria, Ill.
Western Division	David K. Smith		Peoria, Ill.
Western Division	William E. Dorwin		Warsaw, Ill.
Toledo, Wabash & Western	Robert Andrews	J. T. Sterling	Toledo, Ohio.
Eastern Division	K. H. Wade		Lafayette, Ind.
Western Division	C. W. Bradley		Springfield, Ill.
Toledo, Canada Southern & Detroit	D. Edwards		Toledo, Ohio.
Troy & Boston	C. W. Moseley		Troy, N. Y.
Toronto, Grey & Bruce	N. Weatherston	W. Watson	Toronto, Can.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Toronto & Nipissing	J. C. Bailey		Toronto.
Tuckerton	J. Naramore		Tuckerton, N. J.
U			
Union Pacific	S. H. H. Clarke	S. H. H. Clarke	Omaha, Neb.
Mountain Division	S. J. Nichols		Cheyenne, Wyom'g.
Laramie Division	S. T. Shankland		Laramie, Wyoming.
Western Division	O. H. Earll		Evanston, Wyoming.
Utah Central & Southern	John Sharp	S. H. Hill	Salt Lake City
Utica & Black River	J. F. Maynard		Utica, N. Y.
Utica, Ithaca, & Elmira	H. P. Goodrich		Ithaca, N. Y.
V			
Vicksburg & Meridian	E. F. Raworth		Vicksburg, Miss.
Virginia & Truckee	H. M. Yerington	C. P. Mason	Carson, Nevada.
W			
Washington & Ohio	R. H. Havener	Lewis McKenzie	Alexandria, Va.
Wash. City Va. Mid. & G. Southern	*G. J. Foreacre		Alexandria, Va.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Welland	William Pay		St. Catherine, Ont.
Westchester & Philadelphia	Henry K. Smith	J. J. Bryant	Philadelphia, Pa.
West-Wisconsin	W. G. Swan		Hudson, Wis.
West-Jersey	W. J. Sewell		Camden, N. J
Western of Alabama	Chas. P. Ball		Montgomery, Ala.
Western of North-Carolina	John M. Rose		Fayetteville, N. C.
Western & Atlantic			Atlanta, Ga.
Western Maryland	*J. M. Hood		Baltimore, Md.
Western Union	D. A. Olin		Racine. Wis.
Wilmington & Western	David Connell		Wilmington, Del.
Wilmington, Columbia & Augusta	James Anderson	James Anderson	Wilmington, N. C.
Wilmington & Weldon	J. F. Devine		Wilmington, N. C.
Winona & St. Peter	S. Sanborn		Madison, Wis.
Winona & St. Peter		R. W. Hamer	Chicago, Ill.
Wisconsin Central	E. B. Phillips		Milwaukee, Wis.
Worcester & Nashua	C. S. Turner	C. S. Turner	Worcester, Mass.
Wyandotte, Kansas City & N. Western	W. Y. Carlton		Independence, Mo.

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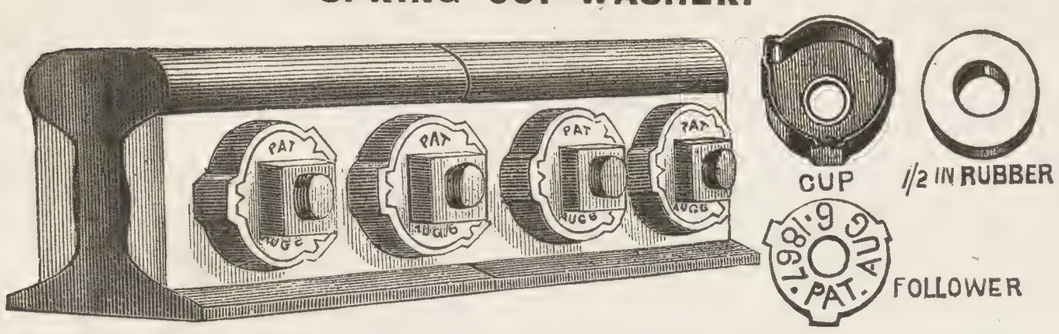


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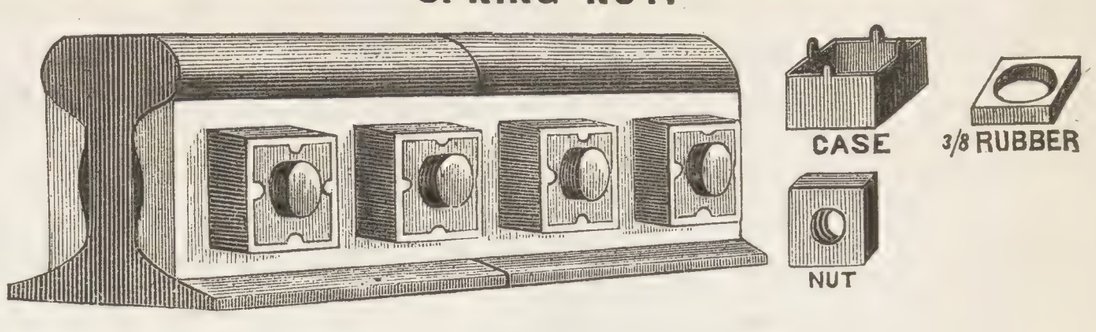
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"SPRING NUT."



Track Bolts and Nuts are constantly subjected to a vibration and jar. One large item of expense is for wrench-work and replacement of bolts and nuts already off.

Most of the contrivances for removing this trouble are failures. They do not remove the cause of the trouble. This can only be done by some elastic material, which will absorb the vibration and prevent its reaching the nuts. Experience proves that permanent elasticity can not be obtained by using wood, which is perishable, or steel, which can not be made of uniform temper. In our inventions, the elastic packing of rubber between the nut and the plate absorbs the jar or vibration, insulates the nut, and by removing the cause of the trouble removes the trouble itself. Among its advantages are these:

1st. It saves the expense of wrench-work and loss of nuts.
2d. The rubber absorbs the blow given by the wheels at the joint, in such manner as to prevent fracture of rails at the joint, and accidents resulting therefrom.
3d. The track is made noiseless.
4th. Rails are saved from pounding out at the ends, and the thread of the bolts and nuts from stripping.

The practical value of these inventions is more fully demonstrated by the two million joints now long in use.

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Special attention given to MALLEABLE IRON CASTINGS for Railroad Car construction.

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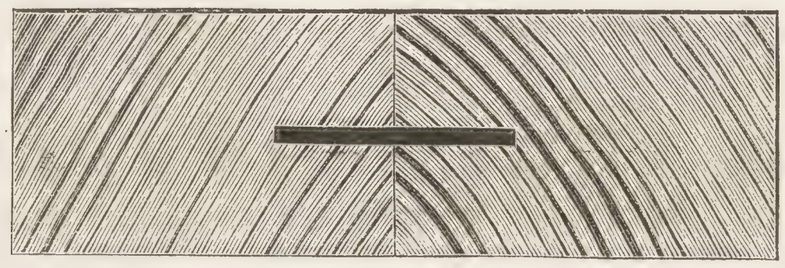
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STAR NUT-LOCK.

Fig. 1

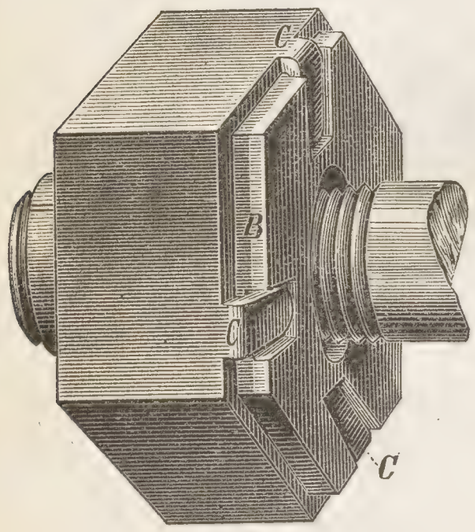
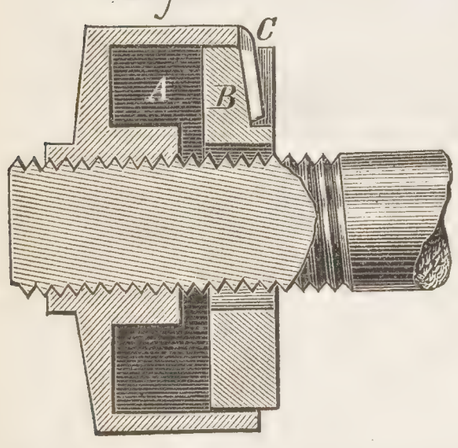


Fig. 2



Patented September 8, 1874.

The Nut-Lock herewith illustrated in perspective (Fig. 1) and section (Fig. 2) is so constructed as to prevent the backward rotation of the Nut under the influence of jars and jolts, and also to take up automatically the expansion or contraction of the bolt due to changes of temperature.

This Nut-Lock is not to be used in connection with Fish-Plates for a period of three years and five months, but for all other purposes it can be used. After that period has elapsed, it can be used with Fish-Plates.

We will guarantee the Nut-Lock not to be an infringement on any other invention. All parties infringing on our rights will be dealt with according to law.

License will be granted to manufacture the above Nut and samples furnished upon application to the

STAR NUT-LOCK CO.,

Leacock P. O., Lancaster Co., Pa.

W. LOUGHRIDGE AIR-BRAKE,

Adopted and in daily use on all the passenger rolling stock of the Baltimore and Ohio, Connellsville and Pittsburg, Marietta and Cincinnati, Sandusky and Newark, Central Ohio, W. P. and S., Orange and Alexandria, Western Maryland, Cumberland and Pennsylvania (with 182 feet of zigzag grades to the mile), and others. The cheapest in equipment and repair, and the most effective brake in the world for general purposes. Better results guaranteed in every-day use than were accomplished in the recent great competitive trial of brakes in England.

I challenge all owners of competing brakes to meet me on public trial, at the great Centennial, in 1876. Rights low, as I am sole owner of my patents.

Refer to any one of the executive officers, master-mechanics, conductors, or engineers on the above roads.

P. O. BOX 441, BALTIMORE, MD.



HARRISBURG FOUNDRY

AND

Machine Company,

HARRISBURG, PA.

Manufacture all kinds of Machinists' and Car-Builders' Tools, for working Iron, such as Lathes, Planers, Slotting Machines, Horizontal Drilling and Boring Machines, Vertical Drills, all sizes, Shaping Machines, Bolt Cutters, Nut Tappers, Car Wheel Borers, Hydraulic Wheel Press, Axle Lathes, etc. Patent Sectional Tubular Boiler, safety and great economy at moderate cost.

Also Oil Tank Cars, Boiler and Sheet Iron work of all kinds, Foundry Cupolas, Cranes, Ladles, etc.

SAMUEL FISK, General Manager.

GEO. DUNBAR & CO.'S

Railway-Car Stove.



The above cut represents our new Railway Wood-Burning Car Stove, which for Style and Economy is unsurpassed by any in the market.

GEO. DUNBAR & CO.

Dealers in

General Railroad Supplies,

19 FEDERAL ST., BOSTON.

General Selling Agents for Boston Car-Spring Co. and Chrome Steel Co.



Union White Lead Manufacturing Co.,

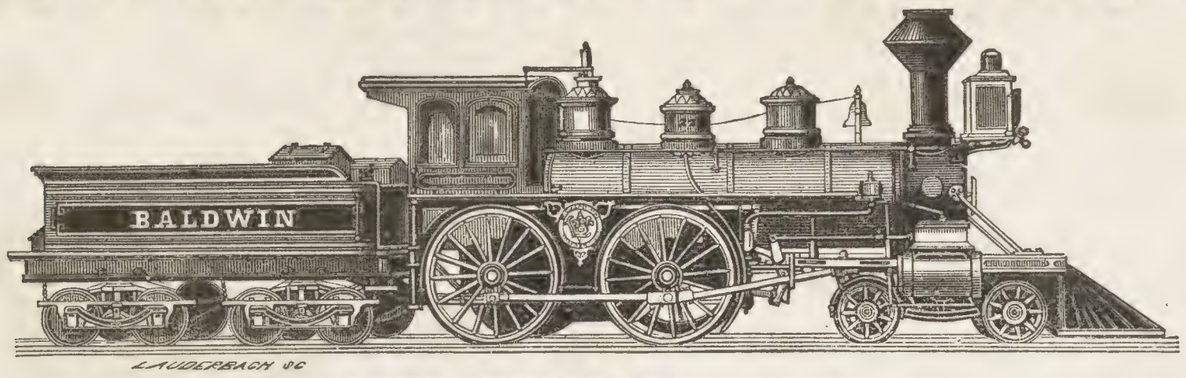
26 Burling Slip, New-York.

B. W. HOW, Secretary. JAMES HOW, President.

MANUFACTURERS OF

WHITE LEAD, RED LEAD, LITHARGE, ORANGE MINERAL.

BALDWIN LOCOMOTIVE WORKS.



LAUDERBACH SC

BURNHAM, PARRY, WILLIAMS & CO., Philadelphia,

MANUFACTURERS OF

LOCOMOTIVE ENGINES,

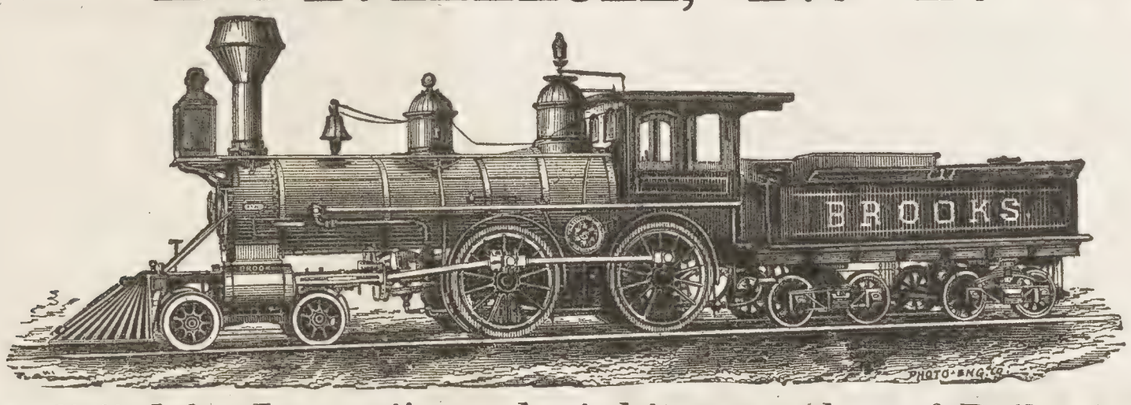
Especially adapted to every variety of Railroad use, including **Mine Engines and Locomotives for Narrow-Gauge Railways.**

☞ *All Work thoroughly interchangeable.* ☜

GEO. BURNHAM, CHAS. T. PARRY, EDWARD H. WILLIAMS, WM. P. HENSZEY, EDWARD LONGSTRETH, JOHN H. CONVERSE.

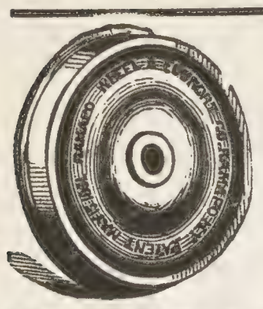
BROOKS LOCOMOTIVE WORKS,

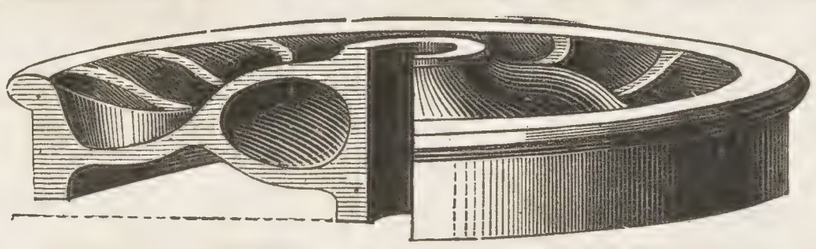
DUNKIRK, N. Y.

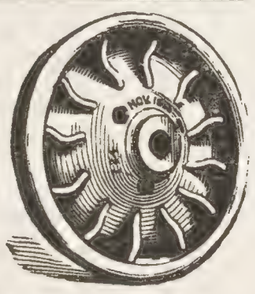


Orders solicited for Locomotives adapted to every class of Railway service.

M. L. HINMAN, Sec. and Treas. **H. G. BROOKS, Pres. and Supt.**







RAMAPO WHEEL AND FOUNDRY CO.,

MANUFACTURERS OF

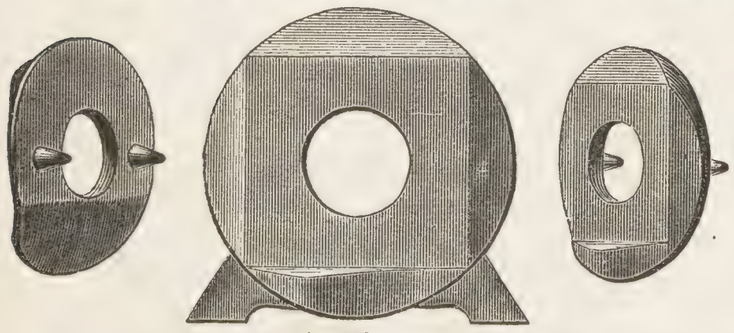
Chilled Wheels for Drawing-Room and Sleeping Coaches,

LOCOMOTIVES, TENDERS, PASSENGER AND FREIGHT CARS.

GEO. CHURCH, Pres't and Treasurer. **W. W. SNOW, Sup't and Gen'l Manager.**

RAMAPO, ROCKLAND COUNTY, N. Y.

KEEN'S PATENT ROCKING NUT-LOCK WASHER.



The only absolutely Perfect Nut-Lock in the market, combining Economy, Simplicity, and Perfect Safety.

The large cut represents the Fish-Plate Washer; the small one on the right is adapted to wood, a bottom view of which is shown in the left-hand cut with beveled side, and the spurs which penetrate the wood. They are in use on a number of Railroads, and give entire satisfaction, supplying the place of Jam-nut and Washer on wood, besides being cheaper and decidedly better. On Fish-Plates, the cost is about the same as that of the Jam-nut.

In ordering Fish-Plate Washers, specify height of rail and square of nut. In all other cases use M. C. B.'s standard size nut, flat side next the washer.

⅝ inch Nut, - - 1⅜ inch square. | ⅞ inch Nut, - - 1⅝ inch square.
¾ " " - - 1⅜ " " | 1 " " - - 1⅞ " "

VOSE, DINSMORE & CO., *Agents,* **32 Warren St., New-York.**

GEO. W. KEEN & CO., *Proprietors,* ***22 NASSAU ST., NEW-YORK.***

SURE CURE FOR

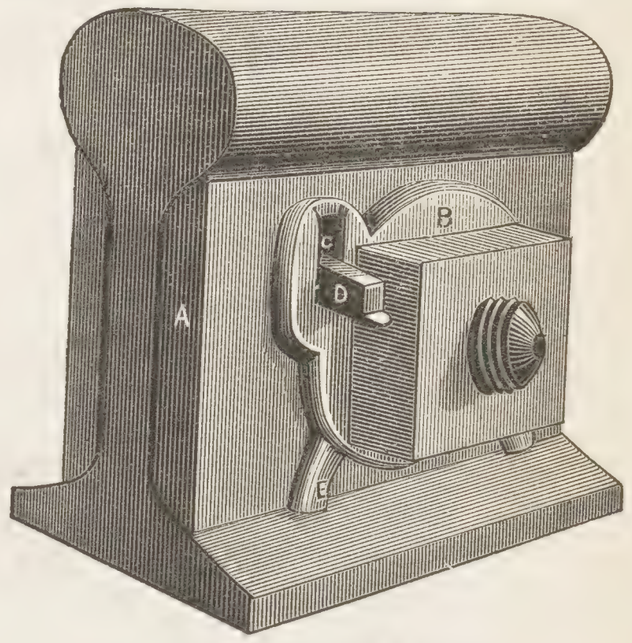
HOT JOURNALS.

See Bridges' Advertisement, Page XII.

PURDIE'S PATENT

Safety Washer,

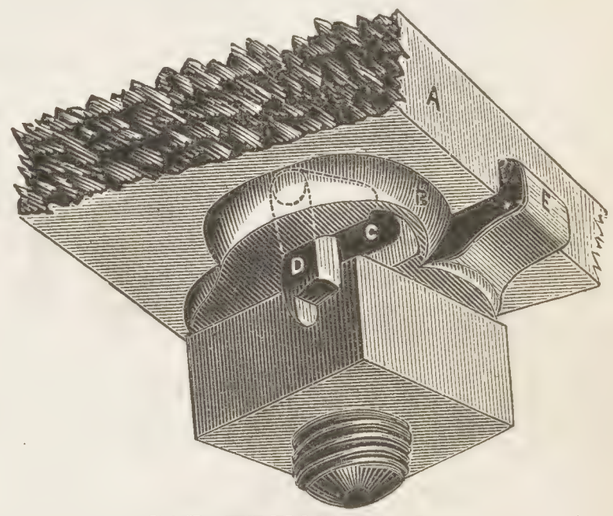
A Positive Nut-Lock, made of Malleable Iron.



For FISH PLATE.

EXPLANATION OF CUT.

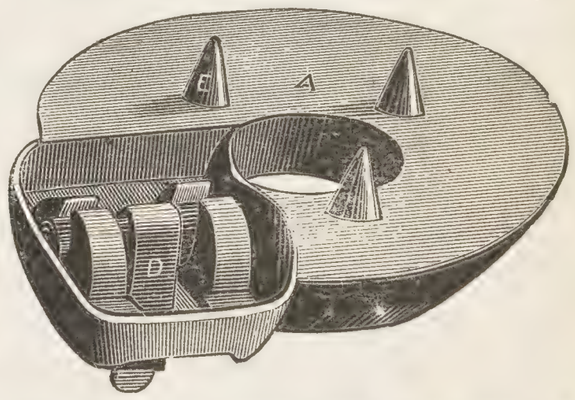
A, Fish plate. *B*, Washer, with projecting feet. *C*, Cavity, into which the dog, *D*, swings, on screwing up the nut. *D*, Pivoted dog which falls by side of nut when screwed home.



CAR TRUCK Washer.

Adapted for use on fish-plate bolts, car trucks, wagons, mowing machines, wood-work of all kinds, or for any purpose where bolts and nuts are used.

Cheap, Effective, and Durable.



Reverse side for WOOD-WORK, showing Method of Pivot Swing.

Will fit on old or new work, no alterations or special tools needed, requiring no rubber or wood for compressing or bending to hold the nut. The dog being in position to lock at any time required, by turning down by the side of the nut when screwed home; should the bolt or thread give any, so as to become loose, the dog will still hold the nut from turning back, and the nut can be screwed up as readily as by the old method.

Have been practically tested for two and a half years on many Railroads, giving unqualified satisfaction, one Railroad alone having them on over 2,500 cars

Cast-iron washers for timber or bridges furnished to any size or weight.

Samples and price-lists forwarded on application to

JOHN PURDIE,

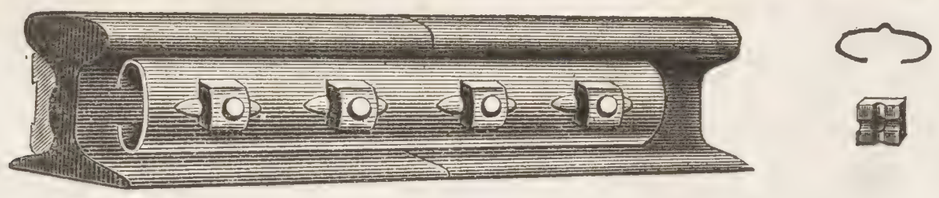
MANAGER OF

Safety Washer Manufacturing Company,

No. 311 MAIN STREET,

BUFFALO, N. Y.

THE GIANT SPRING FISH-PLATE JOINT.

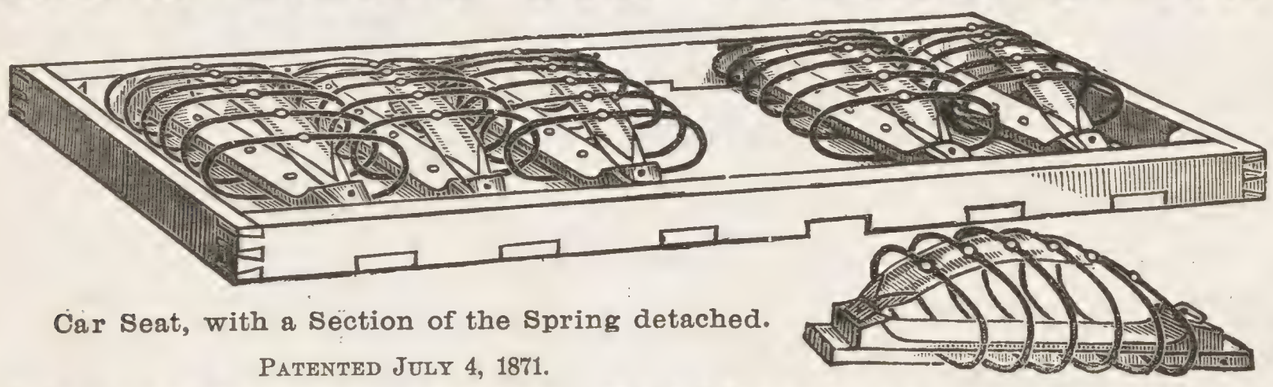


A Combined Nut-Lock and Fish-Plate. The Nuts are securely held in place by a Steel Plate or Rib, and protected from jar and vibration. Costs no more than ordinary wrought-iron plates.

VOSE, DINSMORE & CO.,

32 WARREN ST. NEW-YORK.

COBB'S ELLIPTIC STEEL SPRING.



Car Seat, with a Section of the Spring detached.

PATENTED JULY 4, 1871.

FOR CAR SEATS AND SPRING MATTRESSES FOR SLEEPING CARS.

These Springs have been in successful operation on a large number of the leading railroads in the United States for over three years.

OFFICE OF PULLMAN PALACE CAR COMPANY,
CHICAGO, January 1, 1873.

Z. COBB & SONS, CHICAGO, ILL.:
GENTS: Have used your Patent Elliptic Steel Spring *exclusively* for the last three years in over **300** of our cars, and are satisfied of their superiority over all other springs in use.
A. B. PULLMAN.

Z. COBB & SONS, 292 West Adams Street, CHICAGO.

BRANCH OFFICE: Wilmington, Del.

NEW-HAVEN CAR HEAD-LINING WORKS,

NEW-HAVEN, CONN.

In consequence of the large and increased demand for our "CAR HEAD LININGS" we have been obliged to remove our Manufactory from WORCESTER, MASS., to NEW-HAVEN CONN., where new and commodious buildings have been erected, with increased conveniences for promptly supplying our customers, and we beg to invite your attention to our new and SUPERIOR FACILITIES for furnishing

"CAR HEAD LININGS"

OF THE MOST APPROVED STYLES AND PATTERNS

Either Full Decorated, Part Decorated, Encaustic, or Printed and Plain,

At Short Notice and in the Most Satisfactory Manner.
Orders will be received at the Factory, in New-Haven, Ct., or by

L. G. TILLOTSON & CO.,
No. 8 Dey Street, New-York,

MANUFACTURERS AND DEALERS IN RAILWAY AND TELEGRAPH SUPPLIES OF EVERY DESCRIPTION.

F. J. LAWRENCE,

MANUFACTURER OF

Railroad Car Head Linings,

15 Hamilton Street,

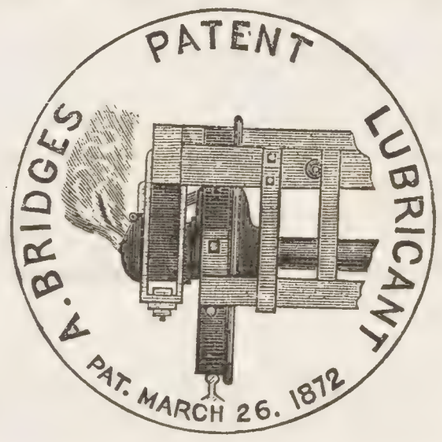
ALBANY, N. Y.

Particular attention paid to Drawing-Room and Sleeping Car Linings.

Refers to Hon. W. WAGNER, Esq., Pres't of Sleeping Car Co.

HOT JOURNALS ENTIRELY PREVENTED

BY THE USE OF



For Railroad Car Journals and other Bearings.

In presenting this Lubricant to the notice of Railroad and Steamboat Managers and Operators in Machinery generally, I do so with a practical knowledge of its merits, and with confidence that it will be found to possess invaluable qualities as a

Lubricator and Counteractor of Friction.

It has been in use, during the past two years, on a number of Railroads and Steamers, and is highly approved of.

Parties wishing to make a practical test of the Lubricant will be furnished with sample on application.

ALBERT BRIDGES, Patentee,

MANUFACTURER AND DEALER IN

RAILWAY SUPPLIES and MACHINERY,

No. 46 CORTLANDT STREET,

SEND FOR CIRCULAR. NEW-YORK.

HERRICK'S CAR WORKS,

OSWEGO, N. Y.,

Are in full operation and stocked with selected material for manufacturing

Box, Platform and Coal Cars,

Prices and terms to suit the times. Orders solicited. Address,

WM. H. HERRICK, Proprietor.

PLANING AND MATCHING

MACHINES

UNIVERSAL WOOD WORKERS

TRADE MARK

WOOD WORKING MACHINERY.

BENTEL, MARGEDANT & CO.

HAMILTON, OHIO.

Send for Catalogue and Price List.

CRANK PLANERS.

Superior Design and Workmanship, Extra Heavy (1400 lb.)

DOWN, ANGULAR & CROSS-FEED,

TO PLANE 12x16x15.

The Hull & Belden Company, Danbury, Ct.

IRON AND STEEL

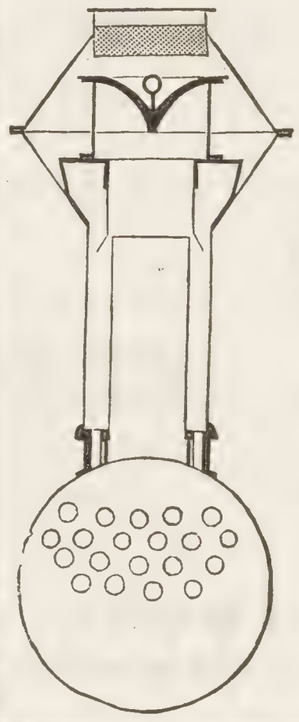
DROP FORGING.

Of Every Description, at Reasonable Prices.

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SPARK-CONSUMING SMOKE-STACK,



For Coal and Wood Burning Locomotives.

Patented June 23, 1874.

MEMPHIS, TENN.

We are now prepared to lay before the Railroad public a Smoke-Stack, which has been used for twelve months on the Memphis and Charleston Railroad, on Passenger, Freight, and Switching Engines, carrying the most combustible article—Cotton—without any danger of Fire whatever from sparks, or annoyance to passengers.

Railroad Companies wishing to use them can be furnished with working drawings by sending size of cylinder of engines to be used upon.

For rights to use the same and full particulars, apply to

ANTHONY ROSS,
Master Mechanic,
Memphis and Charleston Railroad,
MEMPHIS, TENN.

Steel Stamps, Steel Letters, and Figures,

Of every description, and for all purposes.

NAME PUNCHES

For marking tools, patented articles, etc., made in the very best manner, at short notice and on reasonable terms, by

RICHARD H. ROGERS,

ENGRAVER,

Die Sinker, and Steel Letter Cutter,

50 FULTON STREET, NEW-YORK.

Orders by mail promptly attended to.

ATLAS WORKS,

28th Street, Pittsburgh, Pa.

Make a ***Specialty of Freight Car Forgings*** and ***Castings*** delivered to Shops. Also ***Locomotive Cylinders, Frogs and Switches.*** Address,

THOS. N. MILLER, President.

C. VAN HAAGEN & CO.,
PHILADELPHIA, PA.,
Manufacturers of Latest Improved Machine Tools,
Rotary Shapers, Twist Drill Sharpening Machines, Planers, Drill Presses, Portable Drills, Hand or Power, Expanding Boring Bars, Noiseless Friction Gears.
Send for Photographs and Prices.

THE ROCKY MOUNTAIN VERMILION PAINT

Is "Nature's Compound" of COPPER, MERCURY, LEAD, and IRON.

A PURE OXIDE OF METALS. CONTAINING NO EARTHY MATTER.

Hence we claim and are prepared to *prove* that it is the

Best and Cheapest Paint in the Market.

Properly mixed, we will guarantee it to Cover Double the Surface and wear twice as long as ordinary paints. It will not *Peel*, *Scale*, *Crack*, or BLISTER, though subjected to high degrees of heat. It will effectually prevent the corrosion of metals even in mid-ocean. Warranted *superior* to Red Lead, or any other lead, for any and all purposes for which Paint is required. We are fully aware that these statements will be more or less discredited by many, and although we might produce hundreds of testimonials corroborating our claims, even then doubts would exist; and as the most convincing proofs are obtained by actual test, we simply ask you to *TRY IT!* Submit it to any reasonable test you please, and you will soon find that we have not *overstated the facts*, and that *your interest*, and the interests of *all concerned*, will be subserved by the use of the

ROCKY MOUNTAIN VERMILION PAINT.

ROCKY MOUNTAIN VERMILION PAINT CO. Trade Mark.

Furnished dry, in whole and half barrels containing 200 pounds and upward; also ground in pure linseed oil, in barrels or kegs; also in gallon packages, mixed ready for use.

ALL ORDERS SHOULD BE ADDRESSED TO

WILLIAM H. COREY,

General Agent for the United States and Territories,

No. 20 SABIN STREET, PROVIDENCE, R. I.

CAUTION.

Owing to the great superiority of this Paint over all others, causing a constantly increasing demand, some unscrupulous parties are selling inferior articles of paint under the name of

ROCKY MOUNTAIN.

Be sure that each package bears the Trade-Mark of this Company, as herein shown, without which none is genuine.

LEHICTON PAINT AND LINSEED-OIL MILLS,

C. E. HECHT, Proprietor,

EASTON, PA.

Pure Raw and Boiled Linseed Oil, White Leads and Zincs, Colors, Putty, Varnishes, Japans, etc.

SOLE MANUFACTURERS OF THE

CAR COLORS,

so long used and so highly recommended as the cheapest and best covering for all outside work ever offered. The CAR COLORS are all ground in Pure Boiled Linseed Oil, and packed in all sized kegs and barrels.

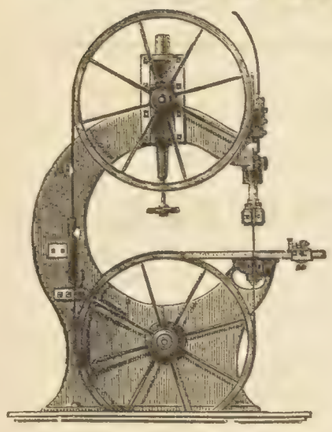
Samples of all the Colors, with Price-List, will be furnished on application.

Sole Agency and Manufactory of Smith & Dean's Patent Crystal Enamel (Filler) for Coach and Car Work.

Wood Cutting Machinery

FOR

Railway-Car Building, Ship-Building, and Band Sawing.



SEND FOR CIRCULAR.

The Celebrated French "**M. PERIN & CO.**" Band Saw Blade,

ANY LENGTH AND WIDTH.

RICHARDS, LONDON & KELLEY,

ATLANTIC WORKS,

22d, Above ARCH, PHILADELPHIA, PA.

SOLID HEAD

NICKEL-PLATED SCREWS.

ADAMS NICKEL-PLATING and MFG. CO.

South Windham, Ct.

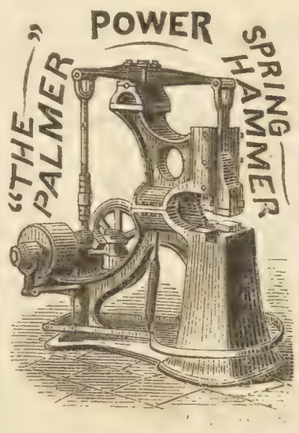
J. F. SULLIVAN,
DESIGNER AND ENGRAVER ON WOOD
No. 23 JOHN ST. NEW YORK

THIS HAMMER

Awarded the First Premium of a Silver Medal

AT THE

American Institute Fair, N. Y. City, Nov., 1873.



Superior in every point to any modification of the Trip Hammer.

Simple, Powerful,

Efficient and Cheap.

Four Sizes now being Built.

For Prices and Descriptive Circulars, address the Manufacturers,

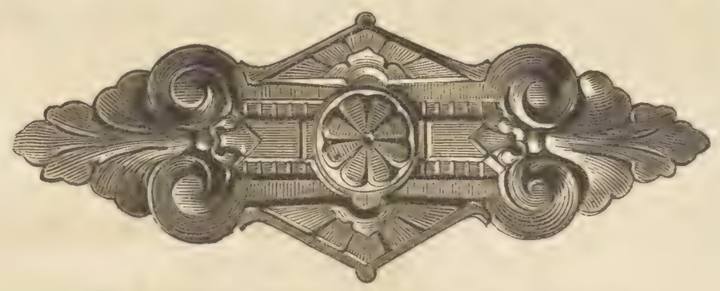
S. C. FORSAITH & CO.,

Manchester, N. H.,

Who are also Builders of the

Abbe Bolt-Heading Machine.

Artificial Wood Ornaments.



We invite the attention of the trade, including

Furniture Manufacturers, Builders, Interior Decorators, Stair-Builders, CAR BUILDERS, Architects. Steamboat Builders, Organ Manufacturers, and others,

To our variety of styles of ornaments, made to match black walnut in color, and which are perfectly fitted for use where not exposed to the weather. They have been sold extensively for several years, and have given entire satisfaction—so that all who have once used them have become constant consumers. They are artistic in design and unequaled in execution, being the production of the best artists, carvers, die sinkers, and moulders.

These ornaments hold glue and screws as well as carvings. They do not warp or crack. They are unaffected by changes of temperature, and withstand dampness as well as furniture. They will polish in every respect equal to wood, either with shellac, oil, wax, or varnish, and with less trouble, as there is no open grain to fill. They will gild or bronze beautifully by simply sizing, without any other preparation.

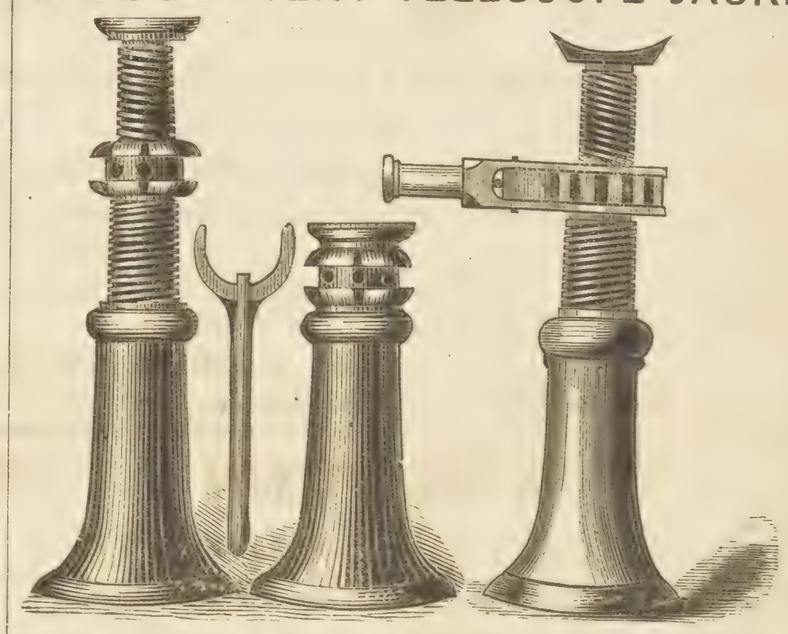
Our goods can be purchased of the Hardware houses in the various cities of the Union. Circulars mailed on application to

WILLIAM B. GLEASON & CO.,

Cor. West Camden Street, and Boston & Providence R. R.,

BOSTON, MASS.

BALL'S PATENT TELESCOPE JACK.



Hot and Cold Punched Nuts, Bolts, Lag Screws and Washers. Belting, Packing Hose, Rubber Springs, Car Trimmings, Steam Pumps.

ALBERT BRIDGES,

Manufacturer and Dealer in

Railway and Mining Supplies and Machinery,

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P. O. Box, 2843. NEW-YORK.

ESTABLISHED 1827.

EDWARD SMITH & CO.,

MANUFACTURERS OF

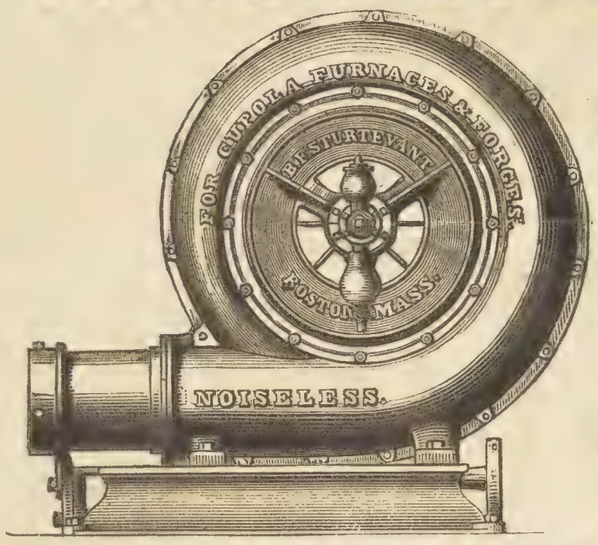
VARNISH

161 William Street, NEW-YORK.

EDWARD SMITH,
JOHN A. ELMENDORF.

STURTEVANT

PATENT STEEL PRESSURE BLOWER



For Cupola Furnaces and Forges.

The Blower which excels all others, **producing *maximum* results with *minimum* power. Used in the largest establishments in the country, where the strongest blast is required.**

STURTEVANT PATENT IMPROVED FAN BLOWER,

For Steam Boilers, Puddling and Heating Furnaces.

STURTEVANT PATENT EXHAUST FAN,

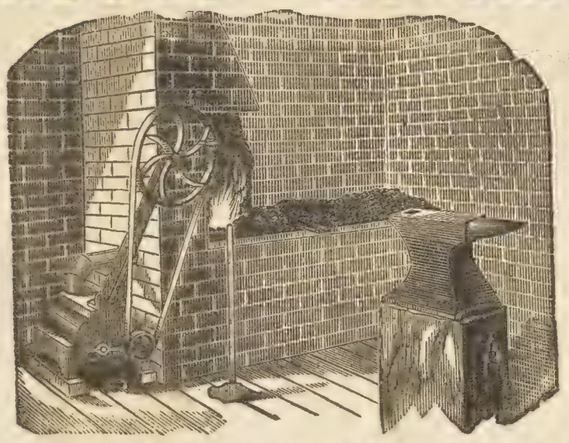
For removing Shavings and Dust from Wood Working Machines, Dust from Sand and Emery Wheels, &c., and for Ventilation.

☞ **SEND FOR ILLUSTRATED CATALOGUE.**

B. F. STURTEVANT, Patentee AND Sole Manufacturer,

70 and 72 SUDBURY STREET, BOSTON, MASS.

ROOTS' ROTARY HAND BLOWER.



FOR ALL KINDS OF

BLACKSMITHING.

DOES MORE AND

BETTER WORK,

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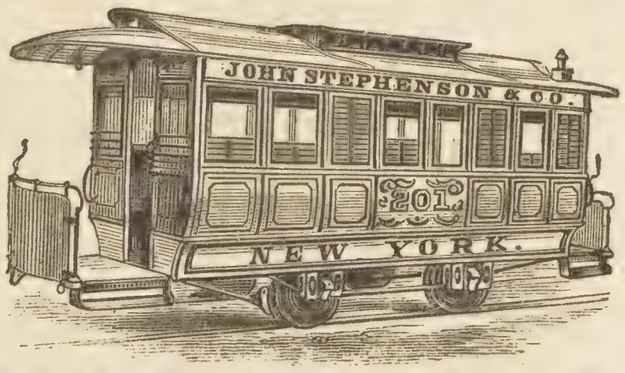
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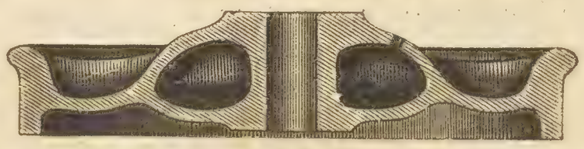


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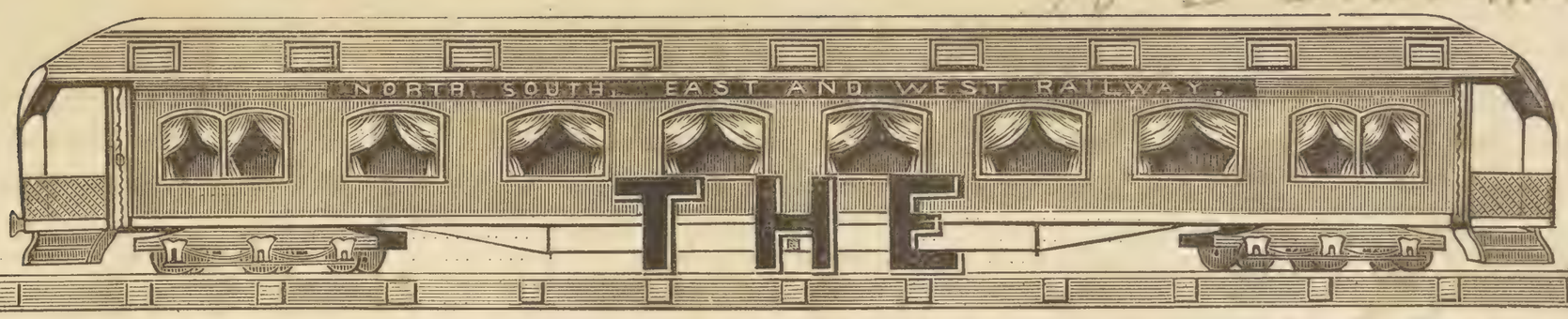
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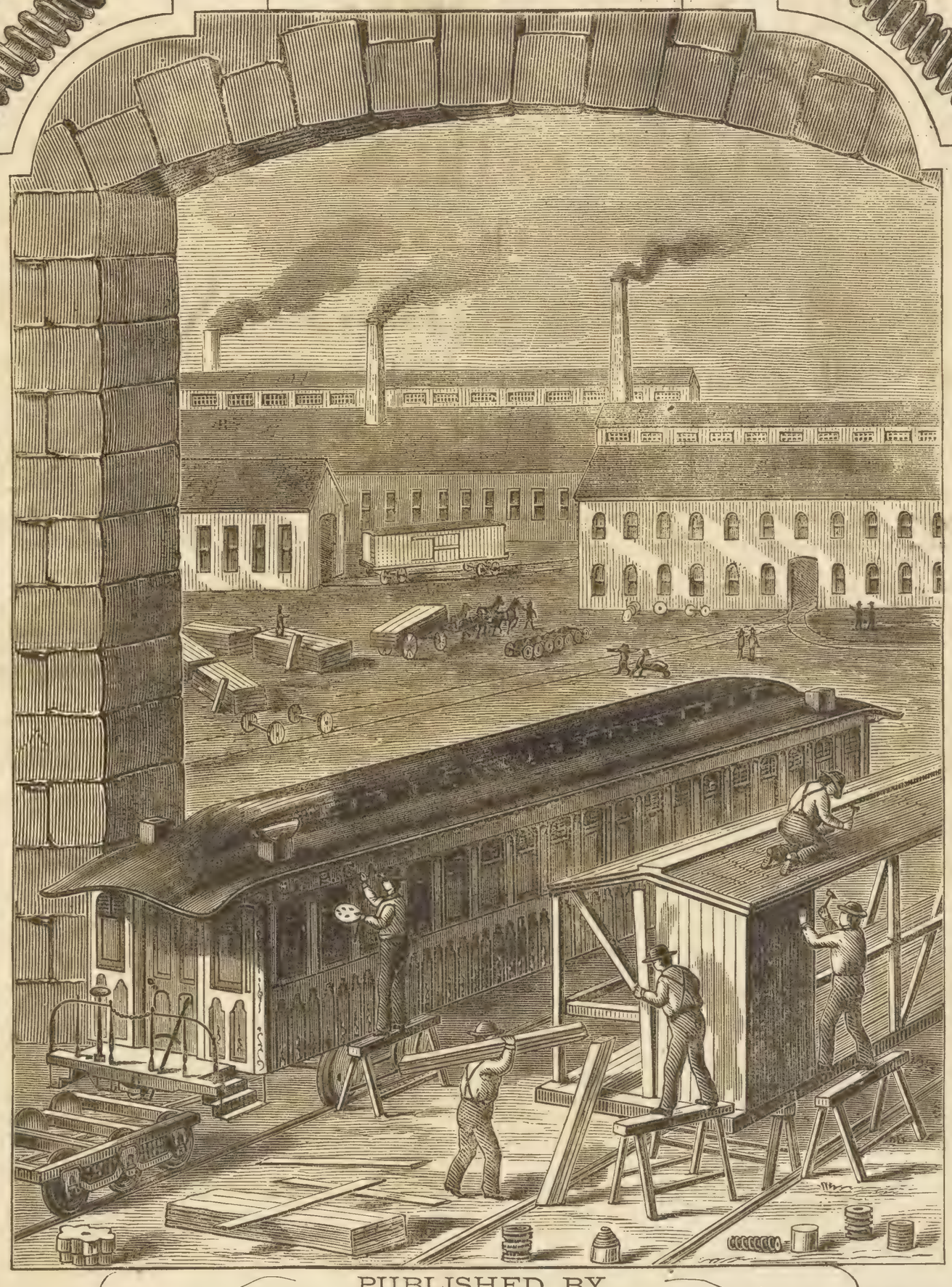
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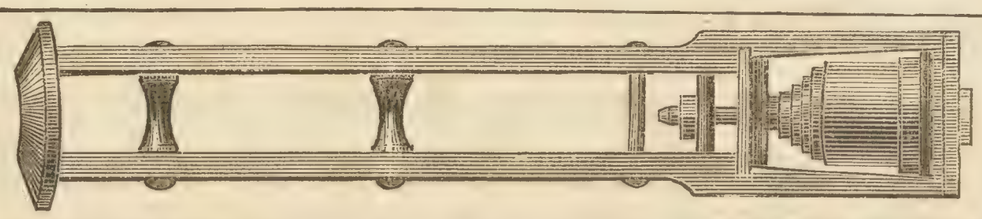
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INDEX TO ADVERTISEMENTS.

Name.	Location.	Description.	Page.
Adams Nickel Plating Mfg. Co	South Windham	Nickel-plated screws	ii
Atlas Works	Pittsburg	Car forgings	xii
Baeder, Adamson & Co	New-York	Curled hair	Cover, 4
Baltimore Car-Wheel Co	Baltimore	Car-wheels	i
Barney & Smith Mfg. Co	Dayton, O	Rolling-stock for R. R.	viii
Battle Creek Mach'y Co	Battle Creek, Mich.	Moulding machines	iv
Baxter, Bell & Co.	New-York	Painters' colors	ix
Bentel, Margedant & Co	Hamilton, O	Wood-working machinery	xii
Berry Bros	Detroit	Varnishes	Cover, 2
Blanchard & Singleton	Washington, D. C.	Patent Agents	iv
Bolton, Myers & Co	Canton, O	Canton Steel Works	iv
Booth, W. & C. W	New-York	Veneers	Cover, 4
Bridges, Albert	"	Lubricator	xii
Brooks Locomotive Works	Dunkirk	Locomotives	xi
Buerk, J. E	Boston	Watchman's Time detector	172
Buffalo Steam Gauge	Buffalo	Steam gauges, etc	173
Burnam, Parry & Williams	Philadelphia	Locomotive engines	xi
Canda, F. E. & Co	Chicago	Disney car coupler	vi
Carr, A	New-York	Steam radiator	iv
Carroll, H. D. & Co	Springfield, Mass.	Hitchcock car ventilator	ii
Carter, W. F	Baltimore	Boiler fluid	172
Cayuta Wheel Co	Waverly	Wheel and foundry	i
Chase Mfg. Co	New-York	Pipe-cutting machine	iv
Chilson, Gardner	Boston	Car-stove	iii
Cobb, Z., & Sons	Wilmington, Del.	Elliptic steel springs	xii
Cole & Comstock	New-York	Veneers	Cover, 4
Columbia Oil Burner Co	Pittsburg	Oil-burning apparatus	Cover, 3
Dudgeon, R	New-York	Hydraulic jacks, etc	172
Dunbar, Geo., & Co	Boston	Railway car-stove	x
Elkinton, L. M	Philadelphia	Refined tallow	172
Empire Portable Forge Co	Troy	Portable forges	iv
Ferguson & Haber	New-Orleans	Machine-picked moss	v
Ferris & Miles	Philadelphia	Steam hammers	i
Forsaith, S. C. & Co	Manchester, N. H.	Power spring-hammer	Cover, 3
Fuller, Lord & Co	New-York	Machine forged nuts	ii
Gleason, W. B., & Co	Boston	Artificial wood ornaments	Cover, 3
Hammer, Geo. D	New-York	Designer and engraver	iii
Harlan & Hollingsworth	Wilmington, Del.	Railroad cars	v
Harrington E., & Son	Philadelphia	Engine lathes	172
Harrisburg Car Mfg. Co	Harrisburg	Railroad cars	Cover, 4
Harrisburg Foundry Co	"	Car builders' tools	x
Hawkes, G. F	New-York	Fountain pen-holder	viii
Herrick's Car Works	Oswego	Box, platform, and coal cars	xii
Hickey, P	Auburn, N. Y	Babbitt's bolt-cutter	iii
Hoopes & Townsend	Philadelphia	Machine and car bolts	i
Hull & Belden Co	Danbury, Ct	Dead-stroke power hammer	iv
Imhaueser & Co	New-York	Watchman's time detector	173
Iron Clad Paint Co	Cleveland	Iron clad paint	iv
I. X. L. Metal Co	St. Louis	Anti-friction metal	iv
Jackson & Sharp Co	Wilmington, Del.	Delaware Car Works	ii
Jewett, John, & Sons	New-York	White lead, etc	vi
Keene, Geo. W., & Co	"	Keene's nut-lock washer	Cover, 3
Langdon Mitre-Box Co	Miller's Falls	Langdon mitre-box	iv
Lawrence, F. J	Albany	Car head-linings	xii
Leffell, James, & Co	Springfield, O.	Patent lever-jack	iii
Lewis, J. T., & Co	Philadelphia	White-lead, etc	vi
Lobdell Car-Wheel Co	Wilmington, Del.	Car-wheels	v
Loughridge, Wm	Baltimore	Air-brake	x
Meneely, Geo. R., & Co	West-Troy	Lead-faced journal-bearing	173
Motley, J. M	New-York	Manhattan Oil Co	Cover, 4
Murphy & Co	Newark, N. J	Varnishes	vi
Nashua Iron & Steel Co	Nashua, N. H.	Cast-steel tires	172
Needham, W. L	Cleveland	Safety signal-light	172
N. Y. Slate Roofing Co	New-York	Gline's rubber roofing	vi
Northampton Emery-Wheel Co	Leeds, Mass	Solid emery-wheels	i
Phelps, Dodge & Co	New-York	Tin and roofing-plates	173
Phœnix Steel-Wire Broom Co	Chicago	Wire brooms and brushes	iii
Pool & Hunt	Baltimore	Engines and boilers	x
Purdie, John	Buffalo	Safety Washer Mfg. Co	xi
Pratt Mfg. Co	New-York	Fish-plate joints	ix
Prince Metallic Paint Co	"	Prince metallic paint	172
Ramapo Wheel & F. Co	Ramapo, N. Y	Car-wheels	xi
Rawlins Metallic Paint Co	Rawlins, W. T	Metallic paint	iv
Read, Geo. W., & Co	New-York	Mahogany, etc	Cover, 4
Reich, A	"	Lehigh brown metallic paint	Cover, 4
Richards, London & Kelly	Philadelphia	Wood-cutting machinery	Cover, 3
Rogers, R. H	New-York	Name-punches	xii
Rogers, C. B., & Co	Norwich, Ct	Wood-working machinery	i
Root, P. H. & F. M	Connersville, Ind.	Rotary hand-blower	Cover, 4
Ross, Anthony	Memphis	Spark-consuming smoke-stack	xii
Sullivan, J. F	New-York	Designer and engraver	xii
Smith, E., & Co	"	Varnishes	Cover, 3
Star Gold Paint Mfg. Co	Alleghany City	Oehlmler's gold paint	Cover, 4
Star Nut-Lock Co	Leacock, Pa	Dittman's star nut-lock	x
R. E. State	Springfield, O	Gardiner's patent attachment	172
Stephenson, John, & Co	New-York	Street-cars, etc	Cover, 4
Stimson & Babcock	Boston	Varnishes	v
Sturtevant, B. F	"	Steel pressure blower	Cover, 4
Taylor, A. S., & Co	New-York	Ornamental glass	Cover, 4
Taylor Iron Works	High Bridge, N. Y	Chilled-iron car-wheels	Cover, 4
Tillottson, L. G., & Co	New-York	Railroad supplies	Cover, 4
Union White-Lead Co	"	White-lead	x
Van Haagen, C., & Co	Philadelphia	Machine tools	xii
Van Orden & Co	New-York	Plastic slate roofing	172
Vose, Dinsmore & Co	"	Cliff elliptic springs	ii
Vulcanized Fibre Co	"	Car-roofs—washers, etc	x
Wason Mfg. Co	Springfield	Cars and car-wheels	xi
Whitney, A., & Sons	Philadelphia	Railroad wheels and axles	i
Williams, Page & Co	Boston	Todd's patent coupling	i
Winslow Car-Roofing Co	Cleveland	Winslow iron car-roof	173

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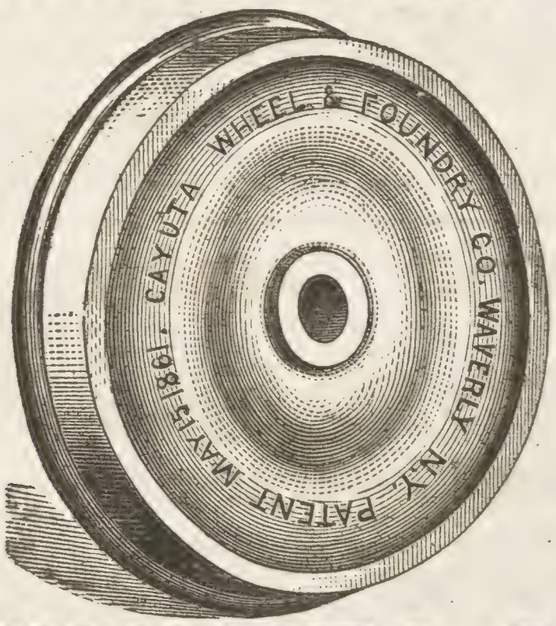
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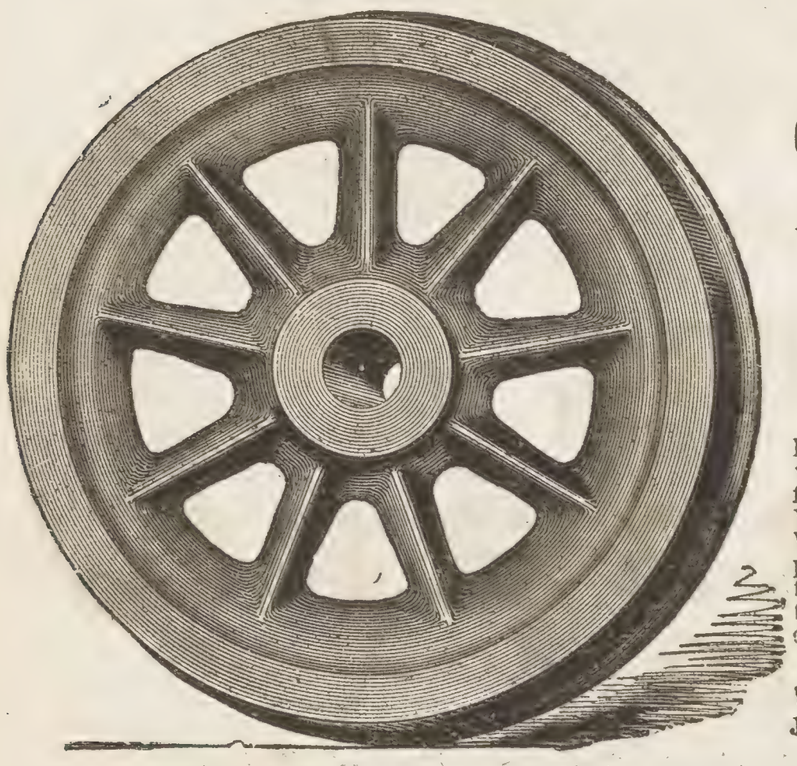
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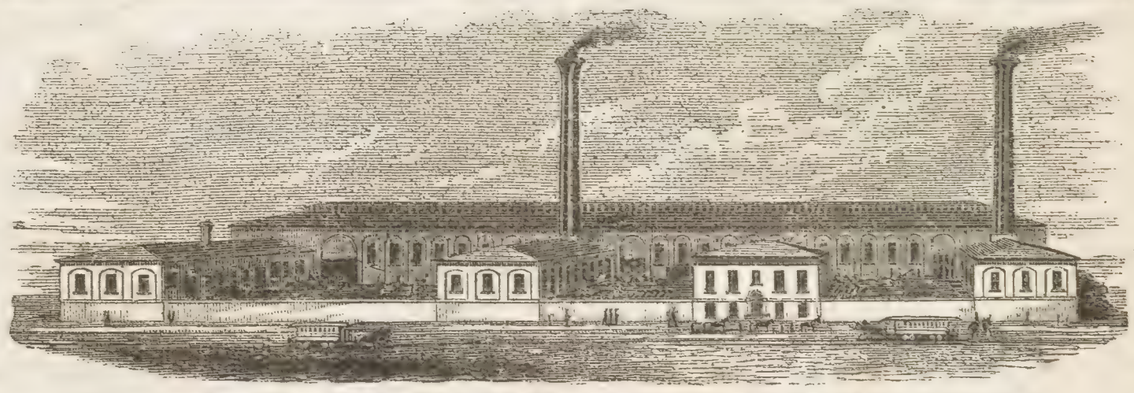
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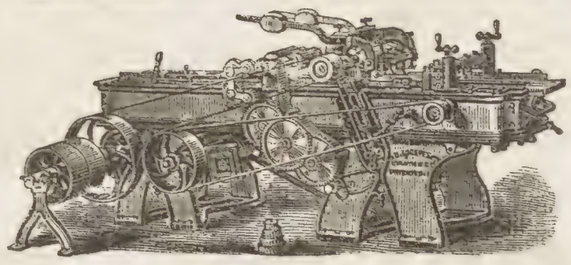
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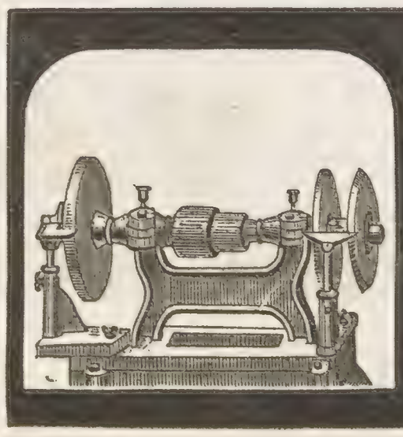
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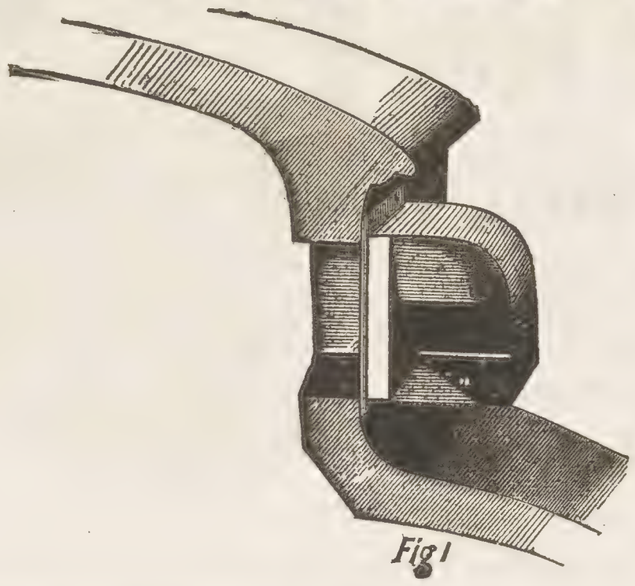


Fig 1

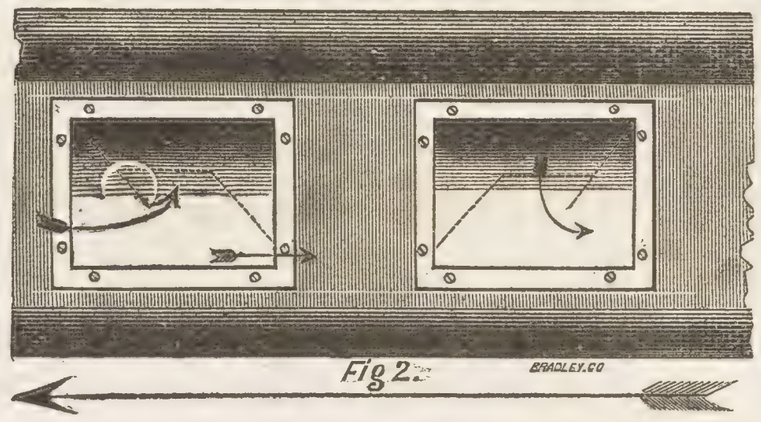


Fig 2

THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place, it is always in readiness, and runs itself independent of all employees.

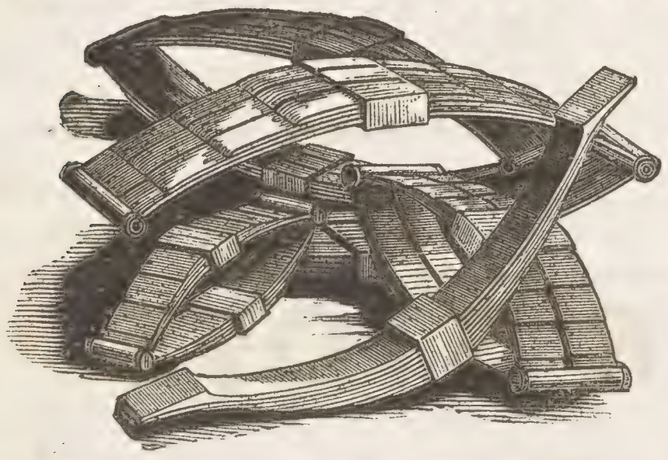
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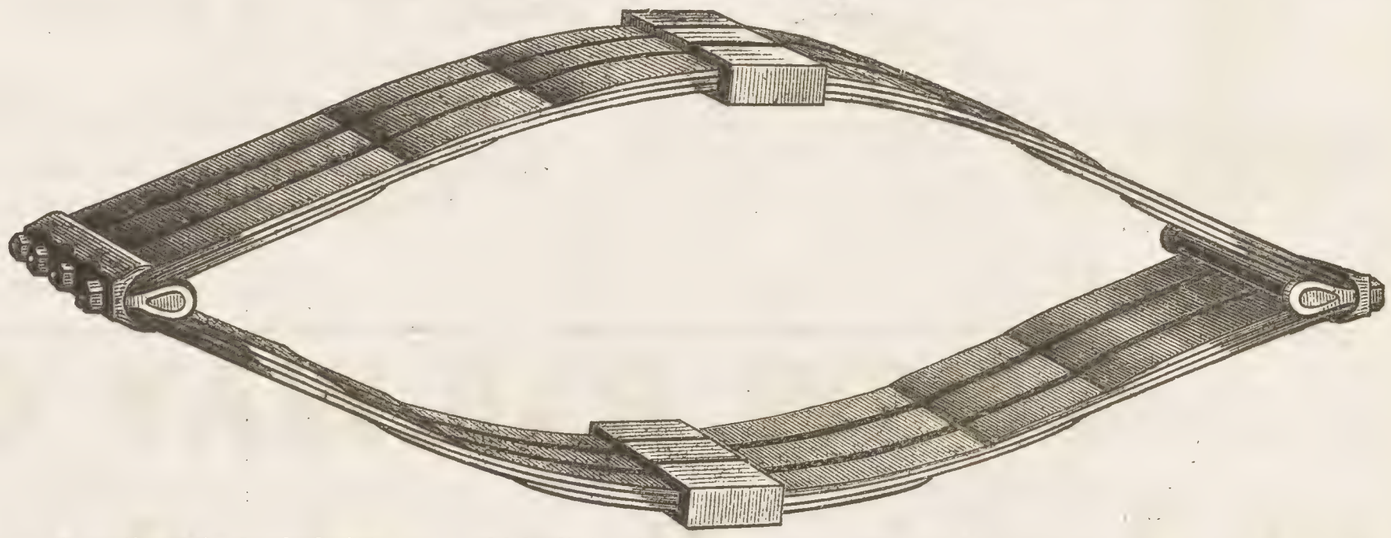
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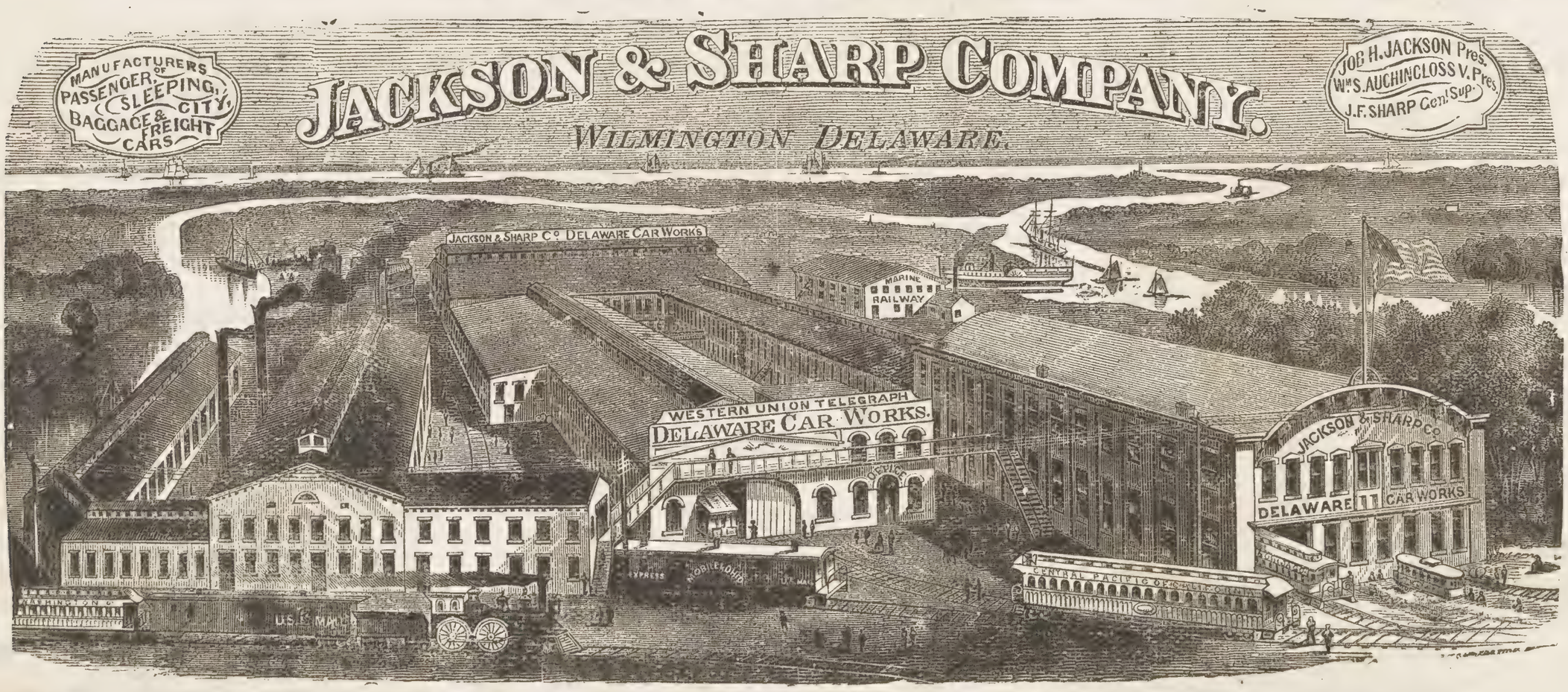


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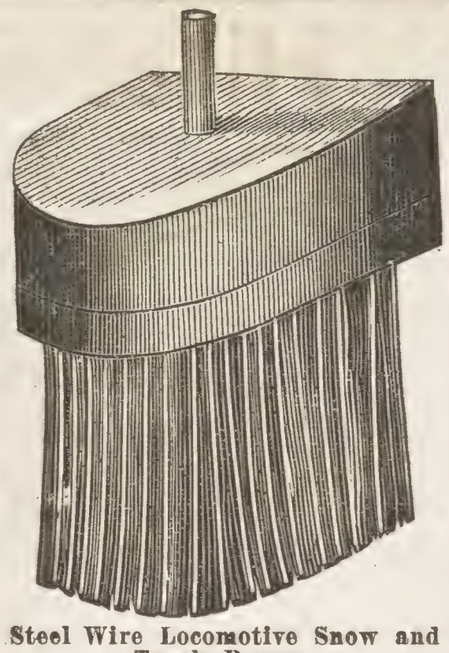
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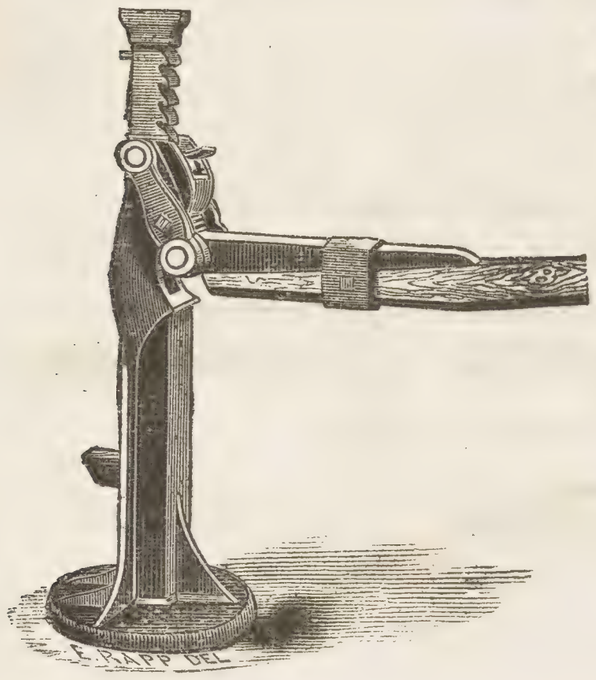
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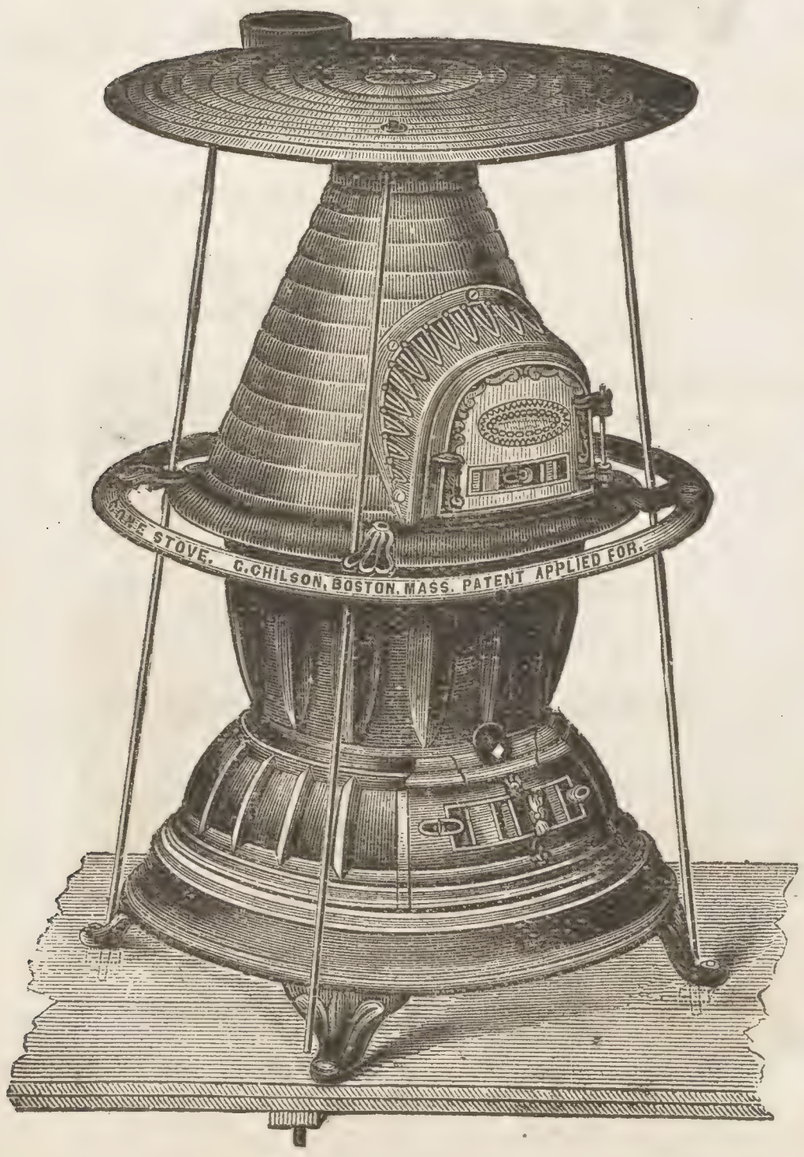
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A NEW RAILWAY CAR STOVE.

Chilson's Patent Cone Disk Stove

ON A NEW AND MODEL PLAN.



I WOULD respectfully call the attention of Railway Managers and others interested in warming Railway Cars, Station Houses, etc., to this Stove, which has been thoroughly tested on several of our railways for a few years past, and has proved in every instance the most successful plan yet devised for thoroughly warming Railway Cars. This Stove is on a new and model plan, differing in principle and operation from all others in the United States. I claim for it *Safety*, *Economy*, *Durability*, *Simplicity*, *Cleanliness, and Beauty of Design*. Its peculiar merits may be stated as follows:

1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.

2. The broad radiating disk prevents the heat from ascending to the upper part of the car or room, but distributes and throws it down to the floor, thoroughly warming the lower currents of cold air in the car or room for a great distance around the Stove, thus securing the long desired object of making the *lower part of the car and floor comfortably warm, especially for the feet.*

3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stoves.

4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.

5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*

6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories, Stores, Offices*, RAILROAD CARS, and STATION HOUSES, *School Rooms, Workshops, etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

The BOSTON AND PROVIDENCE RAILROAD COMPANY have over two hundred of these Stoves in use, and the BOSTON AND ALBANY and several other Roads are adopting them, with the most perfect success.

BOSTON AND PROVIDENCE RAILROAD CORPORATION,
Superintendent's Office, Boston, April, 1873.

GARDNER CHILSON, Esq.: *Dear Sir:* We have about two hundred of your new "Cone" Disk Stoves in use, (a part of them for nearly five years,) for warming Passenger Cars and Stations. I can truly say that they have given entire satisfaction. These Stoves possess many important advantages over any other we have ever used, viz.: for warming the floor and displacing the cold air in the lower part of the car, whereby they are rendered much more comfortable, especially for the feet, than by any other plan known to us. The Stove is more economical in the consumption of fuel, more substantial in construction, and consequently requiring less repairs than any other in use, and so securely constructed as to prevent fire from getting out of the stove even should the car be *overturned*. I cheerfully give my testimony in favor of this Stove, and commend it to all Railroad Managers. Yours, etc., A. A. FOLSOM, *Superintendent.*

Numerous other testimonials received from Railroads and other persons having these Stoves in use in Halls, Stores, etc., may be seen at office. Bolts are not required except for Cars and Steamboats.

Chilson's Improved Celebrated Cone Furnaces, for setting in Brickwork or in Portable Casings, Chilson's Unrivaled Double-Oven Brick Cooking-Range; Chilson's New and Splendid Arlington Portable Range; Chilson's very Superior Arlington Cooking Stove; Parlor, Office, and Store Stoves, Parlor Grates, Registers, Ventilators, etc.

Special attention given to putting up Furnaces and Ranges, and the ventilation of buildings in any part of the country.

☞ Nothing but strictly first-class work is manufactured by me. ☜

Warerooms, Nos. 99 & 101 Blackstone Street, Boston.

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GARDNER CHILSON.

RAWLINS' METALLIC PAINT,

WYOMING.

Warranted Fire, Water, and Weather Proof.

Will cover more surface and outwear any paint manufactured.

CHICAGO, BURLINGTON, AND QUINCY RAILROAD,
MASTER PAINTER'S OFFICE,
AURORA, ILL., March 15, 1875.

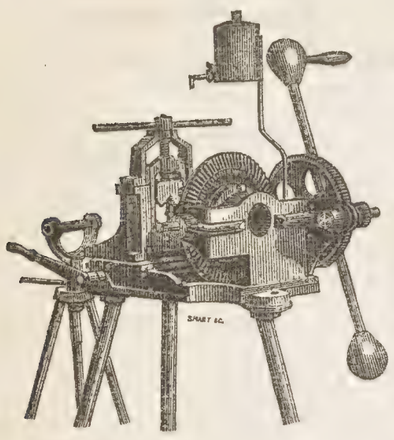
RAWLINS' METALLIC PAINT CO.

GENTLEMEN: I have had your IRON PAINT in test for about six months, and find it one of the best, if not the best, Iron Paints I have ever seen. *I put two coats of it, mixed with boiled oil, on a piece of sheet-iron, and buried it in* STRONG BRINE, *about six months ago, and it has stood the test, and* DOES NOT SHOW ANY SIGNS OF RUSTING THROUGH THE PAINT. I have also used it on Locomotive work, and find that it COVERS FAR MORE SURFACE than any Iron Paint I have used.

Very respectfully yours,
D. C. COOLEY.

CHASE'S

Pipe-Cutting and Threading Machine.



This important tool is designed to fill a want long felt by STEAM AND GAS FITTERS AND MACHINISTS for cutting and threading pipes rapidly and cheaply. An Apprentice Boy, with one of these, can do more work than Two Men with old appliances under our old system. No PIPE SPLITTING! No BEVEL INSIDE OR OUT! It cuts threads and makes nipples for all sizes of pipes, from ½ to 2 inches. Stronger than any machine made. A full set of collars for making nipples goes with the machine.

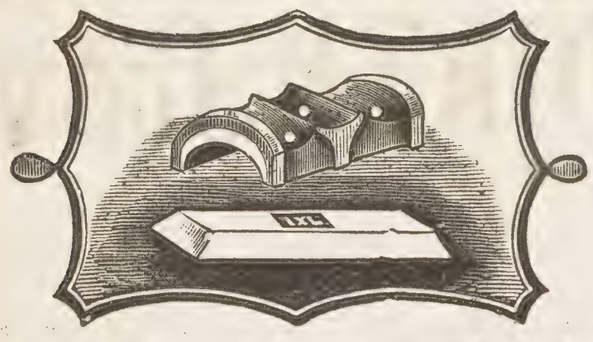
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120 Front St., New-York.

Send for Circular.

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ORGANIZED MAY 1869.



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OFFICE AND FOUNDRY,

No. 7 North Third Street, ST. LOUIS, MO.

Sole Proprietors and Manufacturers of the

I X L ANTI-FRICTION METAL

AND JOURNAL BEARINGS,

Railroad Companies will find a great saving in their expenses, and very little trouble from hot boxes, by using these bearings. A sample set for a trial sent free of charge, by sending a Brass for pattern. Mills, Steamboat Companies or others, will find this a superior Composition for Bearings.

EMPIRE PORTABLE FORGES

NO BELTS, BELLOWS OR CRANKS,
THE BEST MADE.
Send for Catalogue to the
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"DEAD STROKE" POWER HAMMER.

IMPROVED ADJUSTABLE CRANK PIN.
STRIKES BLOW HEAVY OR LIGHT, FAST OR SLOW.
Prices Reduced Jan. 1st, 1875.
The Hull & Belden Company, Danbury, Ct.

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Address IRON CLAD PAINT COMPANY,

CLEVELAND, OHIO.

This Company owns and manufactures under WM. GREEN'S several patents, and is the only Company in the world that makes Paint from pure hard Lake Superior Iron Ore, such as is used in furnaces for making Pig Iron.

The most Economical, Most Fireproof, Most Waterproof, Most Durable, and Most Useful Paint made.

Used by L. S. & M. S. RY.	I. & ST. L. R. R.
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T. W. & W. RY.	L. S. & T. V. R. R.

Etc., etc.

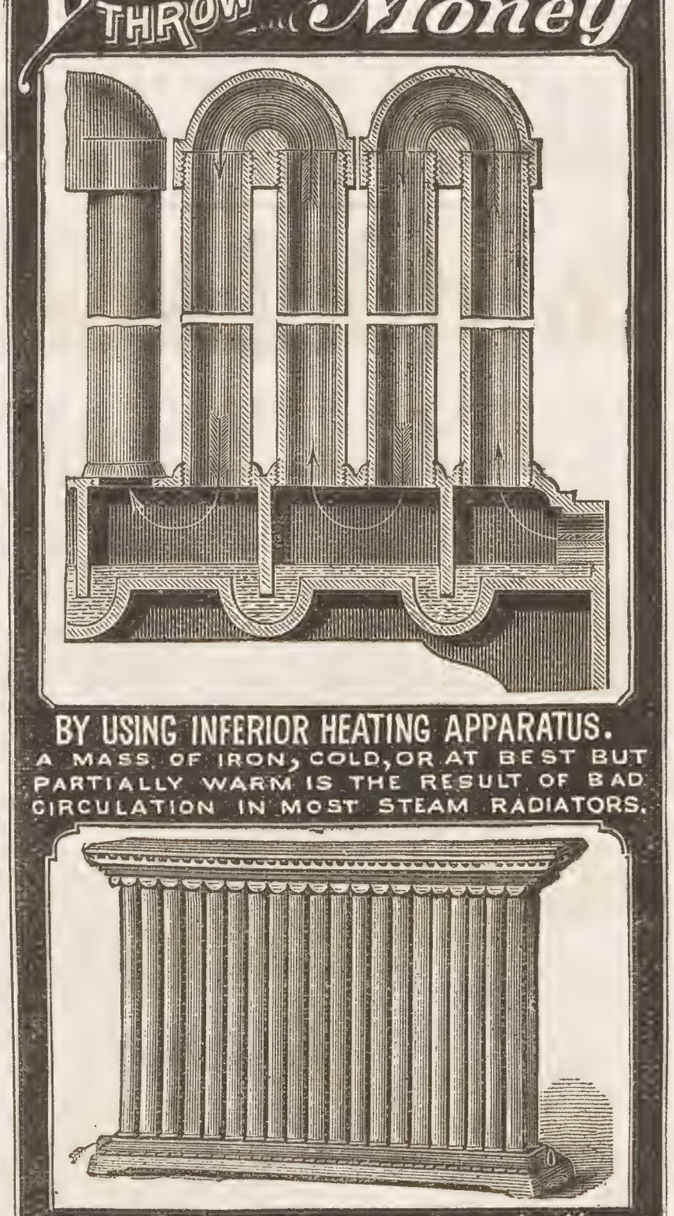
OFFICE OF PURCHASING AGENT
LAKE SHORE AND MICH. SOUTHERN RAILWAY,
CLEVELAND, O., Sept. 12, 1873.

IRON CLAD PAINT COMPANY, CLEVELAND, OHIO:

GENTLEMEN: Your "Metallic Paints" known as "*Iron Clad Paints*" have, in the past six years, been extensively used and thoroughly tested by this Company, as to their *covering capacity, durability, and resistance to atmospheric changes*—latter "paint destroyer"—the most difficult to overcome in outside paints. We can emphatically accord them the highest position over any paint heretofore produced, for Cars, Roofs, Stations, Bridges, etc. The monthly increase of our orders is the best evidence that the Paint is constantly growing in favor with our mechanics.

Very respectfully yours,
A. C. ARMSTRONG,
Gen'l Purchasing Agent L. S. & M. S. R. R

Don't THROW AWAY YOUR Money

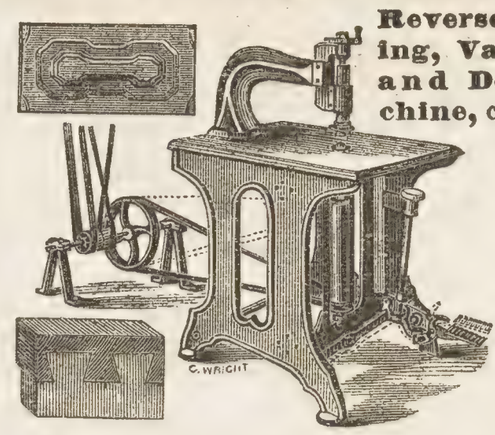


BY USING INFERIOR HEATING APPARATUS.
A MASS OF IRON, COLD, OR AT BEST BUT PARTIALLY WARM IS THE RESULT OF BAD CIRCULATION IN MOST STEAM RADIATORS.

The above cuts represent the sectional and outside views of
CARR'S STEAM RADIATOR
which has a positive circulation
HEATS UP AT ONCE,
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BOULT'S PATENT



Reverse Motion, Paneling, Variety Moulding and Dovetailing Machine, cuts Panels of any design or style of Mould in the solid wood, with neatness and dispatch. Is a first-class Shaper, Edge and Scroll Moulder. Does general Dovetailing with thick or thin stuff.

Simple, Durable, and Efficient.

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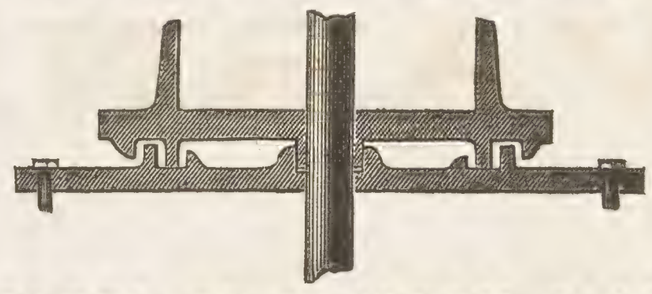


Improved Solid Steel Cutters for all kinds of Variety Moulders made to order, and warranted by the

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CENTER OR TRANSOM PLATE

FOR RAILWAY CARS,

With Oil Receptacle for Bearing-Ring to work in. They are acknowledged to be the best in use. See description and drawings in CAR-BUILDER for January, 1874.

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NEW ORLEANS

Trade Mark, Registered May, 1874.

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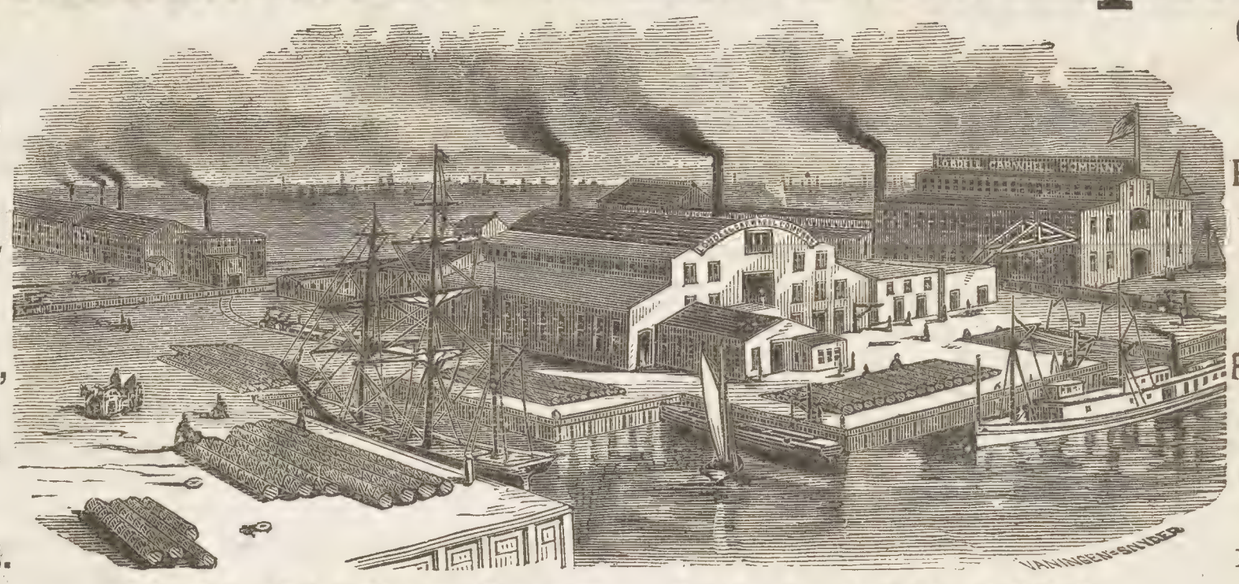
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Having perfected and patented our machinery, we guarantee all Moss put up by us to possess the following qualities—*full length of fibre, freedom from dust, strictness of grade, preservation of elasticity, and exactness of weight*, and used with great success by the leading carriage makers, upholsterers and railroad companies in the United States, as the most economical substitute for curled hair.

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Stimson & Babcock,

VARNISH MAKERS,

Boston, Mass.

RAILWAY CAR VARNISH.

Elastic, pale, and extremely durable, possessing great brilliancy of lustre, and producing a hard, fine **finish,** resisting in the highest degree effects of time and exposure. Should be used over our Rubbing.

RAILWAY RUBBING VARNISH.

Hard-drying, works freely on large panels, will not sweat out, and is very desirable where a fine and durable surface is requisite on which to finish.

LOCOMOTIVE VARNISH.

Dries readily, with brilliant lustre; durable under severest exposure in any climate.

INSIDE CAR VARNISH.

A hard-drying Varnish for inside work; is very light-colored, flows well, and dries in about 12 hours.

JAPAN GOLD SIZE.

Very pale, and preferable to Japan as a drier for delicate colors.

COACH PAINTERS' JAPAN.

A Superior Drier.

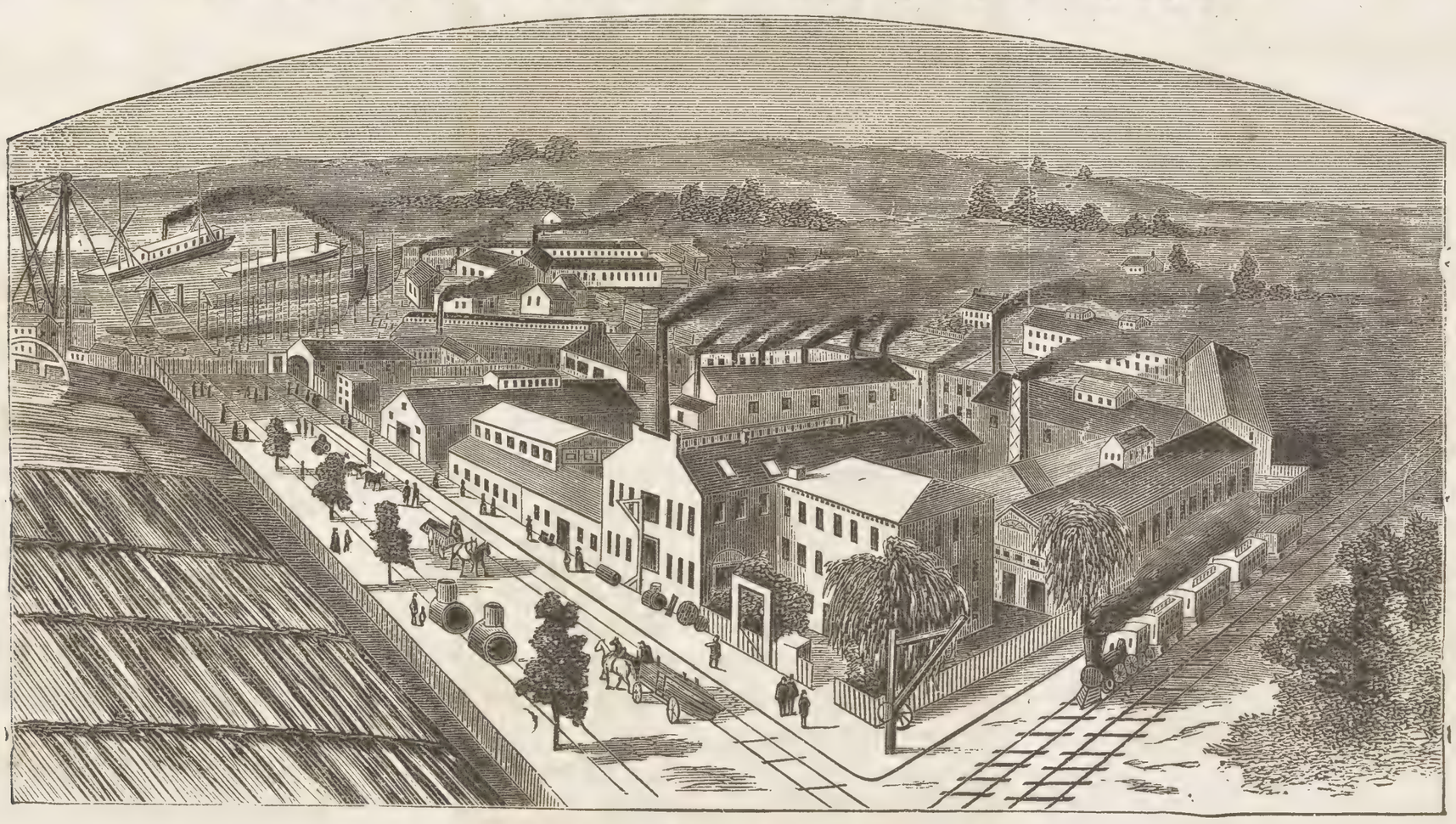
These **VARNISHES** are made with the greatest care and skill, from the best grade of stock, and designed especially for

RAILWAY CAR AND LOCOMOTIVE WORK.

They dry hard, and resist effectually the severest exposure to action of **Cinders, Smoke, or Climate,** having been tested for many years by the leading Railroads of this Country and have proved, for **brilliancy** and **durability,** fully equal to any of either Home or Foreign Manufacture.

THE HARLAN & HOLLINGSWORTH CO.,

WILMINGTON, DELAWARE,



BUILD ALL KINDS OF

RAILROAD CARS:

FIRST and SECOND-CLASS DRAWING-ROOM, SLEEPING, BAGGAGE, MAIL, and EXPRESS, BOX, and FLAT.

MURPHY & CO., NEWARK, N. J.,
MURPHY, SHERWIN & CO. CLEVELAND,
Varnish Makers.

We call attention to the following prices of our Varnishes especially adapted to Railway Uses, and submit that they combine more prominently than any others, the INDISPENSABLE REQUISITES for Railway Consumption. They are of heavy body, light color, quick drying, and are guaranteed to give a maximum of durability.

Wearing Body, (For Outside Finishing.)	**$5 50**
Hard-Drying Body, (For Under Coats on Cars.)	**5 00**
Rubbing Body, (For Under Coats on Cars.)	**4 50**
Inside Car, (For Interiors of Cars.)	**4 50**
Engine Finishing, (For Last Coats.)	**5 00**
Engine Rubbing, (For Under Coats.)	**4 50**
Japan Gold Size, (For Binding and Hardening Colors.)	**3 50**
C. M. Japan, (For Drying and Binding Paints.)	**2 00**
Black Enamel, (For Smoke Stacks of Engines.)	**3 00**
No. 1 Black, (For Iron-Work.)	**1 50**

UNIFORM SUPERIORITY IN QUALITY AND FIXED PRICE TO ALL will continue to characterize these goods, and Satisfaction in their use is assured.

THE DISNEY CAR COUPLER,

Patented June 24th, 1874. Manufactured by

F. E. CANDA & CO.,

CHICAGO, ILL.

Fig. 1.

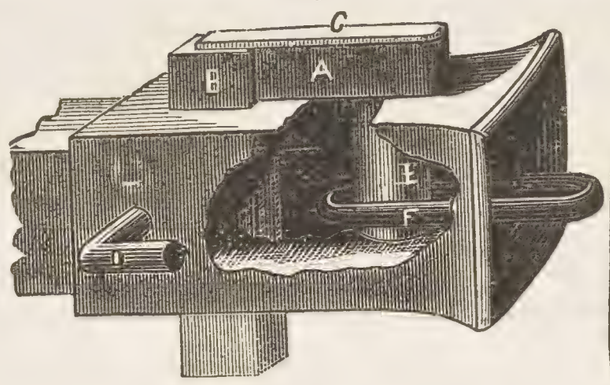


Fig. 2.

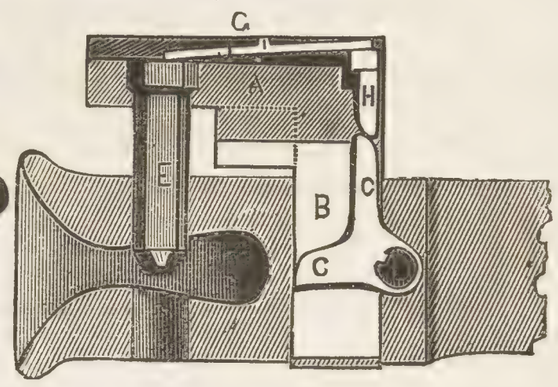


Fig. 1 represents the draw-head with a portion broken away to show the interior.

Fig. 2 represents a vertical, sectional view. *A B* we designate *The Drop*, the upper part *A* serving as the pin-holder. *D* is a lever by which the device is operated, fastened to a shaft passing through the draw-head. *C C* is a forked piece keyed to this shaft. *H* is a small loose pin. *E* is the large pin for securing the link *F*. *J* is a lever resting on the heads of pins *E* and *H*, with its fulcrum on cap-piece *G*. *Then*, when set for coupling or uncoupling, as in Fig. 2, the link *F*, in passing the mouth of the draw-head, raises pin *E*, which by lever *J* forces pin *H* against and displaces the upper arm of *C C*, allowing the *drop* to fall, carrying pin *E* with it.

From the above cuts and description it is apparent that this device combines simplicity in its construction, reliability in its working, and durability in all its parts.

We designate as points of special advantage:

That working from the side of the draw-head, it leaves no opening at the top for dirt, gravel, or accumulations of ice and snow to interfere with the working of the coupler.

That, while the link is always held in a horizontal position for entering, yet it has sufficient vertical movement to accommodate itself to cars of different heights, not exceeding a variation of six inches, without using the crooked link.

That the mouth of the draw-head is of such shape as secures the pin from all liability of bending or breaking.

That it always couples when desired, or set for coupling, and will *never* couple when not desired.

That, working readily from the top and sides of cars, there is no risk of life or limb.

That the pin can never be lost or stolen.

And further, that from its reliability of working, and durability of parts, combined with the device for securing it to passenger cars, makes *This Coupler* the safest and by far the most economical *Passenger Car* Coupler ever introduced.

The Disney Car Coupler, wherever tried or however thoroughly tried, has given the most perfect satisfaction, both as a Freight and Passenger Car Coupler.

For further information, address

H. C. KIBBE, 419 California St., San Francisco, Cal.,

AND

F. E. CANDA & CO., Railroad Contractors and Car Builders,

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Owners of large Buildings within 100 miles of our offices can obtain *Personal* services of one of our Roof Superintendents, who will furnish *full* information regarding best, *cheapest*, and most *effectual* way to Repair Old Roofs, or Lay *New* Ones, thus securing careful estimates from practical men. Correspondence invited.

GLINES' RUBBER ROOFING,

Largely in use on Rolling Mills, Factories, Foundries, Shops, Barns, Sheds and Private Houses throughout the United States.

Over 40,000,000 feet now in use! COMPLETE Materials for a NEW Roof, only 4½ Cents per foot!!

Can be laid by ***any*** one, and is superior to ***all*** other roofings for ***cheapness, fire-proof*** qualities and ***durability. Samples, also 100-page Book Free. Full*** particulars how to repair ***old*** roofs, ***save*** reshingling, ***prevent*** decay, and ***stop leaks effectually and cheaply,*** in roofs of all kinds, mailed ***any*** one stating where they saw this notice; write or call ***at once.*** Glines' Rubber Roofing being very elastic and requiring ***no*** tar or gravel, is strongly recommended by Architects, Corporations, Public Institutions, Builders, and leading men in all sections, for ***new*** steep ***or*** flat roofs. Can also be laid over ***old*** shingles, felt, plastic and mastic roofs with positive satisfaction; will not draw and split apart or crack; is clean to handle; pliable in ***cold*** weather; has ***on*** smell in hot weather; sheds water readily. Correspondence ***invited.*** Agent wanted in every town, and liberal inducements offered.

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JOHN T. LEWIS & BROS. WARRANTED PURE WHITE LEAD. PHILADA.

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White Lead, Red Lead,

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JOHN JEWETT & SONS,

JEWETT & SONS PERFECTLY PURE WHITE LEAD TRADE MARK

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MANUFACTURERS OF

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JEWETT'S PERFECTLY PURE LINSEED OIL RAW, BOILED & REFINED.

WHITE LEAD AND LINSEED OIL.

THE NATIONAL CAR BUILDER.

DEVOTED TO THE INTERESTS OF RAILWAY ROLLING STOCK.

Vol. VI.
No. 12.

DECEMBER, 1875.

$1.10 per Annum.
Single Copies, 10 Cents.

Cheap Transportation and Weight of Rolling-Stock.

At the recent meeting of the American Society of Civil Engineers, at Pittsburg, an interesting paper was read by Mr. Wm. P. Shinn on the subject of cheap transportation, in which he maintained that by reducing dead weight and terminal expenses, increasing back loads, adopting steel rails, and adhering to uniform rates, the actual cost of transportation on cereals and similar products taken in full car loads for long distances, can be reduced to 5 mills per ton per mile, which would justify a carrying rate of 8 mills per ton per mile. A discussion followed, in which the speakers dwelt more particularly upon the weight and character of rolling-stock as it relates to the economy of freight traffic.

Mr. W. Milner Roberts, after referring to river and rail transportation as not being antagonistic but mutually advantageous, proceeded as follows: "I have for years tried to prevent the vast and constant augmentation of the weight of rolling-stock on our railways. The system appears to be this: Locomotives and cars are made as big and as heavy as possible, so as to carry a maximum load on a certain size and weight of rail; then a bigger rail is made, heavier and stronger, to carry that load of freight; and so from year to year rolling stock and track are separately increased in weight and strength. Comparing the weights of passenger or sleeping cars with the live loads they carry, the contrast becomes ridiculous, particularly when we consider that this excess in dead weight is transported over our lines, at 30 or 40 miles per hour. There is a remedy for this, but one very difficult to apply.

The prevailing gauge of railroad, now called the broad gauge, is 4 feet 8½ inches. When I began railway building, this was called a narrow gauge, and I had to oppose what was then called the broad, or 6 feet gauge. The English 7 feet gauge has never been adopted in this country, and but to a limited extent in Europe; 6 feet, however, is and was the gauge on several important roads in the United States. When the Allegheny Valley Railroad was built, about a quarter of a century ago, the majority of the board of directors favored a broad gauge road, believing it cheaper to work and more comfortable for passengers. The question came up before me in Ohio, while constructing the Bellefontaine and Indiana Railroad, which, by the Ohio law, was 4 feet 10 inch gauge. A contract was made with Mr. Wason, a well-known New-England car-builder, for 10 passenger-cars, as wide as those then running on the eastern end of the Atlantic and Great Western, and on the New-York and Erie railroad, which were roads of 6 feet gauge—and with the interior arranged like them. I presume some of these cars are still running. In more modern days has been introduced what is now called a narrow gauge, in comparison with 4 feet 8½ inches. Lines recently built here or in Europe, are of 1 foot 10 inches, 2 feet 3½ inches, 3 feet, 3 feet 10 inches gauge, etc. One of the first railroads in this country, from Mauch Chunk to the coal mines, was 3 feet 6 inch gauge, and it was thought a pretty big railroad at that time (1827). From calculations carefully made, and a thorough study of the subject, I am persuaded that a given weight of freight can be carried at less cost on a railroad of 3 feet gauge, with proper appliances and weight of cars and locomotives, than on one of 4 feet 8½ inches, with the present unnecessarily costly rolling stock.

These questions must be considered in a scientific investigation of the economy of freight transportation. If this Society can, by the presentation of arguments and facts, induce railroad men to look into the matter candidly and seriously, and with a view to greater profits than now are realized on their lines, the freighting business of the country will be greatly improved by reducing the weights of cars, locomotives and rails. Perhaps by substituting a light steel rail and light rolling-stock for what is now used, the difference in the cost of freight on a narrow gauge and on a broad gauge may be lessened, but I doubt if it can be entirely overcome. What is the least gauge for the freight road of most profit, I can not say; I believe it is less than 3 feet. Some contend it will be but a single rail on which runs a 4-ton locomotive, at 15 miles per hour. Two years ago I rode upon such a railroad in Philadelphia, which, it was claimed, was a better system of elevated railroad for cities than that now used in New-York—the Greenwich Street Elevated R.R., and the only elevated city railroad in the world. The railroads in Europe that run into cities, are not, properly speaking, elevated railroads for city passenger travel; those which enter London and other large European cities, over houses and streets, are the great main lines of the country.

Mr. Clemens Herschel.—It is well known that the freight cars on the other side of the "salt pond" are as a rule, short cars with only four wheels. Some of these so-called "bob cars" are in use also in this country, among the manufacturing corporations of Lowell, Mass., for example, and to the superficial observer certainly they seem to present many advantages for the expeditious and economical handling of freight. They can be run and turned on small, light turn-tables, hauled about by only a single horse, and in this way, without switching, can be landed in any part of the yard speedily and with great facility. I should like some gentleman of experience in freight railroading and who knows about transportation in these cars in Europe, to point out the disadvantages of the system and state why it should not be adopted here.

Mr. J. Dutton Steele.—I have observed this peculiarity in handling freight on the other side of the ocean, in short cars, and that the proportion of dead to paying weight is less than with us. I have also noticed here that those companies using four-wheeled cars for certain kinds of traffic, have less dead weight than where the longer cars are used. In the transportation of coal, with which I have been more particularly connected, the Baltimore & Ohio R.R. Co. has given the most attention to the reduction of dead weight, and it was supposed that the minimum was reached in the six-wheeled iron cars used on that line, which, however, were found to be too expensive for general use, and the popular demand settled down to our common four-wheeled coal car. Some enterprising individual, certainly not moved by a careful investigation of the greatest economy to be attained, sprung upon public attention the eight-wheeled coal car which for a time had considerable run, causing our railroad companies to haul 25 per cent. of unnecessary dead weight over their rails; but these cars have had their day, and we have come back to the four-wheeled car for coal transportation. It is thus by hard practical experience, without much scientific aid, I imagine, that in the transportation of one of our heaviest commodities, what may be considered an economical standard has been reached. For the transportation of promiscuous freight the eight-wheeled car seems to be a necessity, particularly for horses and cattle, but in platform and gondola cars a very unnecessary length has in many cases been adopted, seemingly arranged to meet all possible demands, as for very long timber, but certainly causing a movement of dead weight, uncalled for by the purposes for which they are most generally used. Without doubt the economy of railroad traffic will be promoted by railroad officers giving this subject more careful attention.

Mr. Alexander L. Holley.—I would say that box cars for freight are rarely used abroad; the goods are covered with a tarpaulin (which of course is very light), and may be loaded or unloaded under cranes, instead of being moved in and out by manual labor, as must be when box cars are used.

Mr. Felecian Slataper.—In Europe, when building railways, great attention is paid to the permanent way; the tracks are always kept in good condition, and as a consequence the wear of the rolling-stock is greatly reduced. I must acknowledge that their freight cars are better built than ours; in fact, as much care is taken in their construction as with passenger coaches here; by using only the best materials and the most careful workmanship in their cars, an equal weight of freight is carried in cars that weigh only one half of ours, or about 10,000 pounds. Their system of coupling is complicated, yet it has many advantages over ours, especially in the matter of protecting the lives of the train men. Greater attention should be paid to this, and although a more perfect device would cost much more than the one now in use, when the lives sacrificed by our present system are taken into account, this excess will not be considered. Their locomotives do not bear comparison with ours, but in the permanent way we can learn valuable lessons from them for the future improvement of our railroads. There is reference made to

the extravagance practiced in Europe in building tunnels. I believe that many of our members have from experience found that it is cheaper in large cuts, where the materials proved to be of various formations, to build an arch over the track and convert the same into a tunnel; thus by the first outlay saving much expense in keeping the track clear of rock and débris, and making such places absolutely secure from danger. It will be economy now to improve our railways and make them perfect; the interest on the money required to accomplish this would be a small item as compared with the saving in the running expenses. In Europe the cost of maintenance of way is small as compared with ours, solely the result of having built their railroads well and substantially.

Mr. William P. Shinn.—I would suggest as a proper subject for experiment, the possibility, so far as wear and tear upon the track is concerned, of improving freight cars by the use of better springs. A year or more ago it was stated to me as the result of experiments made with a lever, one end placed under the ordinary fish-plate joint of a rail, and the other end carrying a pencil to mark the deflection, that the truck of a 20-ton sleeping-car caused a deflection less than did the truck of a freight car of equal weight, although the speed was much less. It was stated that the experiment had been tried many times and for several days on all the trains passing over certain joints, and the conclusion was that the different effects were due to the springs of the cars. It is well known to those having to do with the equipment of railways, that the springs of freight cars are generally very poor, and that some cars have scarcely any.

Continuous Train-Brakes.

THE annual report of the Railway Master Mechanics' Association contains an interesting report of the committee on this subject. After adverting to the superior advantages of the Westinghouse brake, the committee express the opinion that the air-brake of the future must combine equal efficiency with a cheaper and simpler compressing apparatus, and whether this can be attained by a donkey pump, or by utilizing the working machinery of the locomotive, or the momentum of the engine and train, is the problem to be solved. Two new inventions are then referred to, namely, the Henderson Hydraulic Brake, and the McBride Hydraulic Brake, both of which make use of steam pressure as the power, and water as the agent for transmitting it. A brief description of the former is then given as answering for both, and the report then proceeds as follows:

"The committee hazard the opinion that a fluid, like water, devoid of elasticity and liable to freeze at a low temperature, will hardly be able to supersede compressed air as a transmitter of power to continuous brakes. It requires a considerable amount of power to overcome the inertia of a long column of water and put it into rapid motion, and also to check that motion suddenly; and such operations are always accompanied by concussion or 'thumping' in the machinery used, unless mitigated by a cushion of air, as in the familiar example of the air-chamber placed on the suction and delivery pipes of pumps. Any medium, then, which is sluggish in its action, and when finally put in motion imparts the full pressure suddenly to the brake shoes, is not so desirable as one which can be put in motion *instantaneously*, but which *gradually* brings the pressure up to the maximum.

"In the circulars issued by inventors of brakes, much stress is laid upon their ability to make short stops with their peculiar kinds of brake. Now, the old Loughridge Friction-Brake made as good a record in that respect as any of its successors, but the application of the brake communicated a sudden shock to the cars, which was any thing but agreeable to the passengers, and, in fact, sometimes emptied the seats. The great advantage of the air-brake is, that this sudden shock is avoided without the efficiency of the brake being impaired. The movement of the brake-blocks should be simultaneous, or nearly so, with the application of the pressure, and the release of the same by the engineer.

"It may not be out of place to state a simple rule for determining theoretically the retarding power of a good continuous brake as a means of comparison with actual reported results.

"Let us suppose that a train, consisting of an engine weighing thirty tons, with a tender weighing twenty tons, and six cars weighing twenty tons each, in all 170 tons of two thousand pounds, is running at a speed of forty miles per hour on a straight and level track. It is required to know the distance in which said train can be brought to a state of rest, and the time consumed, after shutting off steam and applying the brakes, which are assumed to be fitted to the tender and six cars. A speed of forty miles per hour is equivalent to fifty-eight and seven-tenths feet per second, and by the law of gravitation a body projected vertically into the air with an initial velocity of that amount will ascend fifty-three and a half feet before it is arrested by the force of gravity. Similarly a railroad train moving on a horizontal track at the same speed, will be brought to a state of rest after shutting off steam, if a retarding force can be applied equal to its own weight. The resistance of the atmosphere is not taken into account in either case at present.

"Now the retarding forces available for stopping a train, are the friction of the brake-shoes upon the wheels, the axle friction, the rolling friction of the wheels upon the track, and the resistance of the atmosphere. The brake friction bears a certain proportion to the pressure applied, and varies somewhat with the condition of the weather, but one sixth of the pressure applied may be considered a fair average allowance.

"The pressure upon the brakes is limited by the weight on the wheels fitted with brakes, and the weight on the wheels must *always* exceed the sum of the brake pressure and axle and rolling friction, to prevent sliding of the wheels. If we allow one ton for axle and wheel friction, to be on the safe side (it is actually less than half that amount), it will leave 139 tons available for brake pressure, and one sixth of this, twenty-three and one-sixth tons, or 46,333 pounds, will be the brake resistance. To this we must add the axle and rolling friction, and the resistance of the atmosphere, which, at the speed indicated, may be set down in the aggregate at fourteen pounds per ton of train, or 2380 pounds, and the total resistance will then be 48,713 pounds, or one seventh of the weight of the train. If, as before shown, a train will run fifty-three and a half feet in one and eighty-two one-hundredths seconds if the retarding force is equal to its own weight, it will run seven times that distance, or 374 feet, if the retarding force is one seventh of that amount, and will consume about thirteen seconds of time.

"But this calculation is based on the supposition that the full brake pressure is applied at the instant of shutting off, which is *never* the case in practice.

"With the original Westinghouse Brake, three or four seconds are usually consumed in getting full brake pressure upon a train of six cars, and it will be safe to assume that a distance of 160 feet will be passed over before the full effect of the brake can be exerted; and if this distance is added to that previously given, the total distance run after shutting off and applying the brake will be 234 feet, and the time required may be roughly stated as sixteen seconds."

The reading of the report was followed by a discussion. Mr. Setchel, of the Little Miami Road, said: We have in use the Westinghouse Brake on sixty cars and twenty-three engines; and I must say I was quite surprised to see that the expense was so light as it proved to be. Immediately after the Chicago convention I gave orders to have an accurate account kept of all the material used for engines, and gave the result to the committee. I am not satisfied with the action of the air pump of the Westinghouse Brake. I think it might be made more simple and less expensive. I can not see why the Westinghouse people will persist in using that expensive pump, unless it is to keep up an appearance which will justify the enormous price they ask for the use of the brakes. Every member here knows very well that there is ample opportunity of placing upon the locomotive an air pump in almost any position that you desire it, and which could be worked by the engine when in motion. The objection made to this is, that you must always have air stored up in your reservoir. That I do not consider a sufficient objection. If your reservoir is tight it needs only a stop cock to be turned upon the pipe leading to the reservoir to maintain as much pressure as you need at all times. That would be just as simple as it is to turn the three-way cock in the Westinghouse Brake. A sufficient pressure could thus be maintained at all times, and the reservoir of air could be kept while the engine was standing in the house as well as on the road; and thus we will always have a sufficient amount of air to stop the train. By this arrangement the expense of equipping an engine would be twenty-five per cent less than what it is now—I mean for the pump alone. The

LOUGHRIDGE AIR BRAKE

which has been adopted on the Baltimore and Ohio Road, as I have been informed by engineers that have run it, involves no expense whatever except for the oil used upon it. It is a much simpler arrangement, and it seems to me that the members of the convention ought to give a decided expression of their opinion in favor of something that is not so expensive as the Westinghouse pump.

Mr. Lannon, of the Western Maryland Railroad—I would state that since last February we have been using the Loughridge Brake. We have it on three engines. Two trains are fully equipped with it. The expense of equipping an engine and train is very little. We find no difficulty in retaining air in the reservoir over night. We go into the engine house with seventy-five or eighty pounds of pressure in the reservoir. We put the stop cock as close to the reservoir as we can get it, and when the engine is put away—say at night—this is closed, and in the morning when we come out on the table, the cock is opened, and we find by the air-gauge that we have not lost over three pounds during the night. The pump and reservoir cost us about $80. The reservoir contains thirteen cubic feet. It has given us no trouble; in fact not as much as the ordinary hand-brake that we were using before adopting this. No other springs are required to throw the brake off the wheels, than those used for the ordinary hand-brakes. We have no trouble in starting the train on some of our hardest grades, some of which are 95 feet to the mile.

ENGINE DRIVER-BRAKES.

Mr. Strattan, of the Pennsylvania Railroad, said that a large number of engines on that road were being fitted with driver-brakes applied either by levers or by cones. He had ridden only twice on the engines having them; the elasticity of the air in the cylinder seemed to compensate for the vibration. He at first thought that the application of leverage between the wheels would strain the axles in opposite directions, as against any wear that might occur in the boxes, but it did not seem to have that effect. The side-rods could be run with driver-brakes equally as tight as without them. The momentum of the engine also, by taxing the car brakes less, would result in a benefit to car-wheels. Although there was some doubt about the utility of driver-brakes when first applied, they were gradually gaining in favor. They could be applied easily so as not to affect the tire injuriously.

Mr. Woodcock, of the Central Railroad of New-Jersey, had several engines running with driving-wheel brakes, and his experience was that they were wearing the tires, and wearing them irregularly; that is, not all alike. The brakes worked very nicely, but it was a question whether it would pay to continue their use at the expense of the tires.

Mr. Young, of the C. C. C. & I. R R., had applied the brake to one engine a few months ago. It seemed to wear the tire very much and also the brake shoes. A set of cast iron shoes would run only about 250 miles, with the ordinary stops, before they would have to be renewed. The brake was fitted up with the cam motion of Westinghouse. There seemed to be altogether too much power when applied to the wheel, so much so that the engine would jump as though it had been reversed, and no brake had been applied to any other part of the train.

Mr. Hudson, of the Rogers Locomotive Works, suggested that if the brakes were to be used continuously for ten or fifteen miles, the tires must be fastened so as not to turn round or get loose, because the heat imparted to them tended to loosen them. In such cases it would be necessary to fasten the tires in some way so they could not be moved either laterally or otherwise.

Mr. Robinson, of the Great Western of Canada, confirmed what Mr. Strattan had said. He was afraid of the side-draw, and thought there would be a severe action on the springs and also on the side-rods, but found that such action was entirely counterbalanced. He used only one brake at first, to give it a trial; run the engine at high speed, and came to a full stop without any jerking motion. It was simply the wheel-brake acting against an air-brake. The brake had been in use over nine months. He thought the driver-brake was too powerful to use all at once, and preferred to use the train-brake by itself, and the driver-break only in cases of emergency, so as to bring the train to a full stop after the first shock had been received.

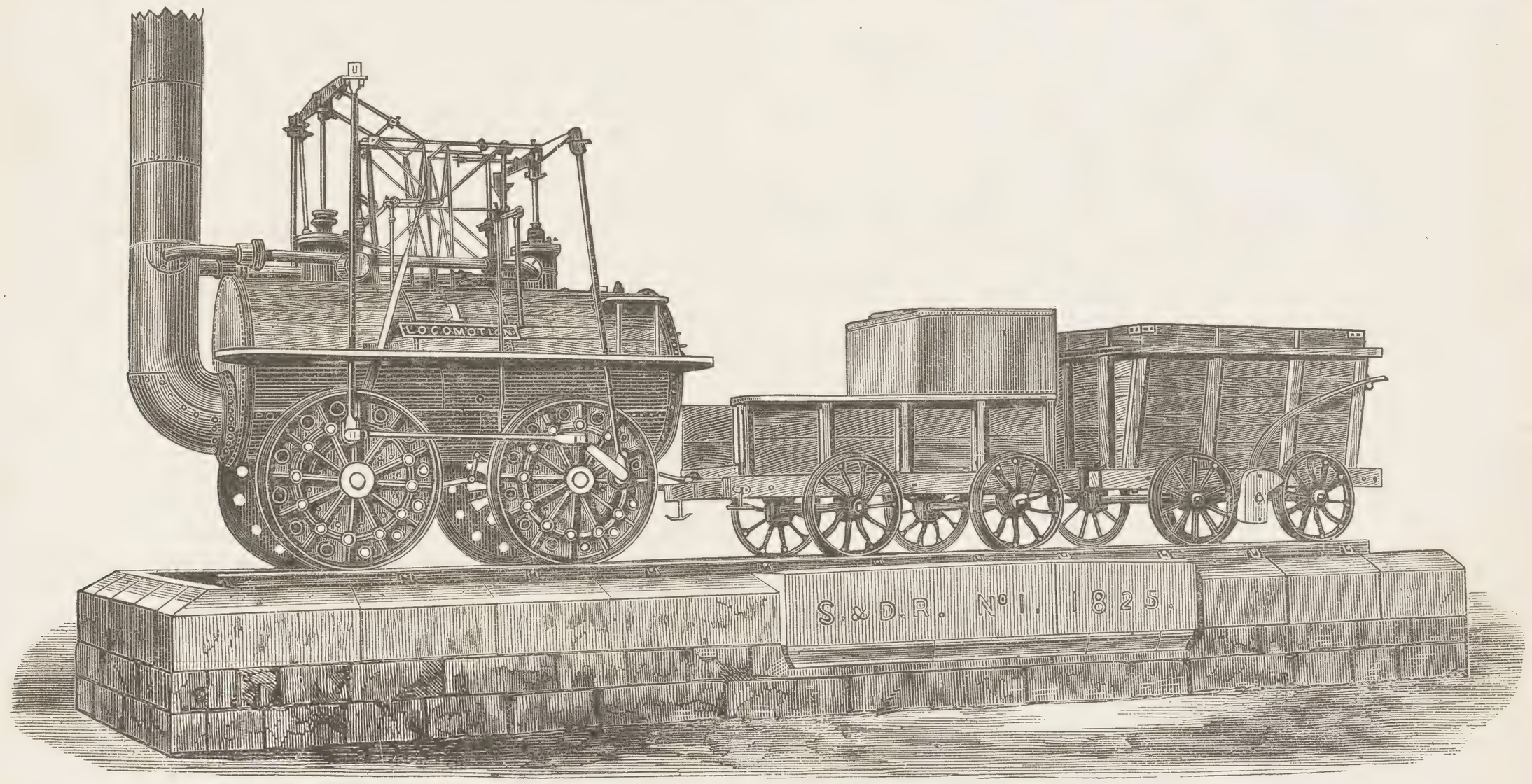
THE Brooks Locomotive Works have sold to the Illinois Central Railroad two engines with 17 x 24, and three with 16 x 24 cylinders; also one engine with 11 x 16 cylinders, to the Cincinnati and Westwood narrow gauge Railroad. The works have several others of like capacity under construction.

The First English Passenger Locomotive.

THE engraving represents the locomotive and tender-wagons used in hauling the first train of cars over the Stockton and Darlington Railroad, in England, fifty years ago. The train consisted of a number of coal, merchandise, and passenger wagons, and ran over the track at the very moderate speed of eight miles an hour. The event, as our readers are aware, has recently been celebrated with much enthusiasm as the practical inauguration of the great railroad system of the world. The locomotive and wagons, as represented in the cut, have been placed upon a massive pedestal, as a monument to indicate the rude germ which has since expanded into such amazing development.

The plain, straight boiler, ten feet in length by four feet in diameter, has a single flue and sixty square feet of heating surface. The safety-valve lifted at twenty-five pounds pressure. Above the generator are two cylinders, ten inches in length by twenty-one inches stroke, their pistons working cross-beams which were coupled to the connecting-rods, which in turn rotated the wheels. A loose eccentric sheave and bell-cranks operated the flat slide-valves; and from a crosshead on the piston rod, the pump was worked. Add a wooden framework, no brakes, a little tender capable of holding 240 gallons of water, and the picture of the machine which annihilated the pet theories of the majority of the skilled engineers of its day, is complete.

The ludicrous contrast between this comparatively clumsy and diminutive machine, and the ponderous and powerful locomotives of the present day, can be seen at a glance by every one who is familiar with the construction and capacities of the latter, a contrast that is fairly exemplified in the speed of eight miles per hour as compared with sixty miles.



The First English Passenger Locomotive.

American Locomotives in Russia.

A CONSULAR report from Russia says: "The first ten locomotives were imported to St. Petersburg in 1872 from the Baldwin Locomotive Works of Philadelphia, followed by twenty more from the same firm, and last summer fifty more were contracted for at the Grant Factory, in New-Jersey. The great moment of this incipient trade will be apparent from the fact that there is an immense field here open for their import for many generations to come, the railroad lines to Russia having just begun to develop on a greater scale, those in operation hardly reaching to 18,000 English miles up to this day. The small locomotives heretofore built in Russia, at the rate of 100 to 120 only a year, also those imported from Germany, France, and Belgium, were all built for consumption of wood for fuel till the agent of the Philadelphia firm had brought the attention of the consuming departments to the fact that anthracite coal of best quality can be found around the town of Worenesk, in Southern Russia, extending over 180 miles, and that whole regions were abounding with it in the southern half of the empire, sufficient to feed the locomotives of the whole continent. The American locomotives finally accepted and introduced here, being expressly built for coal consumption only, have led Russian capital to the development of the now quite numerous coal mines in the district named. On account of the faultless finish of the American locomotives and their superior power, guaranteed to haul on a level 1075 tons, in lieu of those heretofore in use, hauling but 650 to 700 tons, they are much preferred, as the higher price paid for them (namely, 25,000 silver rubles apiece, instead of 18,000 to 20,000 silver rubles paid for those brought in from Germany and Austria) would indicate."

THE Illinois Central Railroad uses the old Timms journal-box on passenger and freight cars, and is not troubled with hot boxes or broken axles. The reason assigned is, that by a peculiar attachment to the inner end of the oil-box, the oil is prevented from leaking, and consequently the journals are not alternately heated and cooled and thus rendered liable to break. Many axles on the road have been in service twenty years. The precise nature of the attachment can not be clearly shown without drawings. It consists of a slotted iron ring shrunk on the axle within the oil-box, and $\frac{1}{16}$ of an inch from the inner end of the brass bearing. The ring is $\frac{13}{16}$ in. wide and $\frac{5}{8}$ in. high, with a slot or groove in it $\frac{5}{8}$ in. deep. A fan-shaped leather washer is bolted to the oil-box and fits into the groove in the ring, thus very effectually keeping out dust and preventing loss of oil.

THE Otis Steel Works, of Cleveland, Ohio, recently rolled a perfect sheet of steel 28 feet long, 5 feet wide, and $\frac{1}{2}$ an inch thick, designed for fire-box plates. The ingot weighed 3400 pounds.

The Union Pacific Railroad.

MR. D. C. BROOKS, the senior editor of the Chicago *Railway Review*, has recently made an extensive tour along the line of this road and through the contiguous Territories, and gives the results of his observations in an elaborate article which is deserving of a permanent place in railway literature. It is contained in two consecutive numbers of the *Review*, and occupies nine pages. The necessity, origin and progress of the enterprise are dwelt upon, the topographical obstacles that had to be surmounted, the physical features and present resources of the vast belt of territory through which the road runs, and the development which may be looked for in the near future. The road has been in operation six years, and is now a perfected line a thousand miles long, which in location, permanent way and equipment, in station and terminal facilities, and in its system of maintenance and operation, compares most favorably with the best of the lines connecting Chicago with the Atlantic and the Mississippi. We make the following brief extract descriptive of the

PHYSICAL GEOGRAPHY OF THE ROUTE.

"Of the vast region—200 miles from north to south, and 1500 miles from east to west, embracing the Plains and Rocky Mountains—it is estimated that not less than two thirds, or 1,500,000 square miles, is good pasture land the year round. It has been only within ten years that ignorant prejudice and superstitious traditions first gave place to a real knowledge of the country; and when plain common sense came to be exercised it was naturally enough concluded that a country which had for ages given sustenance to myriad herds of buffalo and flocks of antelope and elk, animals whose flesh is unrivaled for tenderness, juiciness and flavor, could not but be adapted to the sustenance of the kindred animals of civilization. A necessity which compelled the experiment on a large scale and under the most exacting conditions had now verified this presumption. The discovery of the precious metals gave rise to an emigration across these plains unprecedented even in the overland traffic of 'the Orient' in ancient days. A movement of such vast magnitude, and continuous the year round and from year to year, was possible only through a land capable of subsisting countless beasts of burden. Not only did the cattle attached to the trains mainly subsist along the route during the summer, but they had to be wintered on the plains after the season's work. So late as 1865, however, no stock of any consequence was encountered other than that used in transportation; and for a year after the opening of the railway only small herds were met with here and there near the road. To-day, in the long ride of 800 miles, flocks and herds are rarely out of view; and for hundreds of miles together the country is filled, almost to its capacity in places, with cattle, sheep and horses, sometimes to a distance of 25 miles or more on either side. The prominence already given in the writings of journalists and *savants* to the results of grazing has served to diffuse a tolerably correct knowledge of a country from which the 'great civilizer' has so recently lifted the veil of mystery and prejudice. The 'American Desert' lies half-revealed as a clime as fair, and a land as rich as the sun ever shone upon; and the country along the whole line, plain and mountain, is coming to be understood as one of special characteristics, adaptations and resources in its various portions. As the result of all, three belts are distinguished, stretching north and south, the arable, the pastoral and the mineral, identical with prairie, plain and mountain. These very equally divide the thousand miles from the Missouri to Salt Lake. The first embraces, along with Iowa, Missouri and Arkansas, fully one-half of Minnesota, Nebraska, Kansas, the Indian Territory and Texas. It is destitute alike of mountain and level, and is one undulating prairie, forming the largest continuous body of farming land on the globe. In like manner the pastoral belt is continuous in its features, a treeless, grass-covered plain, its 'magnificent distances' reaching to the far horizon in vast, gently undulating stretches, possessing a fascination like the ocean. The mountain-region, in its open portions, has sufficient resources, semi-pastoral and agricultural, to materially aid the development of its mineral stores. Its aspects to the tourist are the most striking conceivable. The Snowy Range rises, a mountain-shore, out of this sea of Plains; and its elevations, and the gradations by which they are attained, are no less impressive to the imagination than are their 'awful forms' to the eye. From the Missouri River the ascent is uninterrupted at the rate of about 10 feet per mile for the whole distance to the mountain-base. The arable belt is lost in the pastoral at an elevation of about 2500 feet (that of the Alleghenies); and the plain thence sweeps up in grand tidal swells, breaking into huge billows against the mountain-range at an elevation of one mile above the ocean. And this is the average elevation of the surface of the mountain plateaus ('Parks') which are encompassed by ranges rising a mile higher still, and these again send up a few isolated peaks nearly a mile more, far above the line of vegetation. The 'Parks,' like San Luis, South, Middle and North, each containing hundreds of square miles, are the sources of the great western tributaries of the Mississippi and the Gulf. Viewed from one of these solitary summits, the plain to the east seems like an ocean, illimitable, blue; while, amid the wilderness of ranges and groups on every hand, the great Parks appear, looking, with their ridges, cones and intervals, like island-studded inland seas. Fed by ten thousand mountain-streams rushing down the 'rims' of these basins there pour into the plains through grand cañons the tributaries of the great streams crossing the plains. From the Rio Grande to the head of the Missouri, no fewer than 34 of these rivers are numbered, some ten of which rank as great; and they aggregate, as an enthusiast has expressed it, 'fully 12,000 miles of living crystal waters.' Of smaller streams flowing down the range along a distance of 2000 miles, the number is little short of 400.

"As to the river topography of the mountain-route, it is to be noted that while it peculiarly adapts the country along nearly the whole 500 miles from Cheyenne to Ogden, to grazing, it especially facilitates the development of the vast and varied mineral resources in which lies the chief promise of profitable development. Along the mountain-ranges, rendered so accessible at every point by the scores of river-courses, lie known mineral deposits inexhaustible; and of these the most immediately serviceable are the vast beds of coal and iron, which in immediate proximity to the road, outcrop along the river banks, accessible with the slightest expenditure of skill, labor and money. Down these swift-flowing streams also will come for years all needed supplies of timber, for wood and lumber, not only, but, should a good coking coal not be found at once, for charcoal as well, adequate for some time to the necessities of iron manufacture and metal reduction."

Early Use of Iron and Steel.

IT has sometimes been questioned whether the Egyptians had a knowledge of steel. It seems unreasonable to deny them this knowledge. Iron was known at the earliest times of which we have any record. It is often mentioned in the Bible and in Homer; it is shown in the early paintings on the walls of the tombs at Thebes; it has been found in quantity in the ruined palaces of Assyria; and in the inscriptions of that country letters are spoken of as having been made out of iron, which is also so mentioned in connection with other metals as to lead to the supposition that it was regarded as a base and common metal. The quality of iron which is now made by the native races of Africa and India is that which is known as wrought iron. Dr. Percy says the extraction of good malleable iron, directly from the ore, "requires a degree of skill very far inferior to that which is implied in the manufacture of bronze." The supply of iron in India as early as the fourth and fifth centuries seems to have been unlimited. In the temples of Orissa iron was used in large masses as beams or girders in roof-work in the thirteenth century, and India well repaid any advantage which she may have derived from the early civilized communities of the West if she were the first to supply them with iron and steel. If we look still further to the East, China had probably a knowledge of the use of metals as soon as India, and, moreover, had a boundless store of iron and coal. A great future is undoubtedly in store for that country; but can the race who now dwell there develop its resources, or must they await the aid of an Aryan race? The art of extracting metals from the ore was practiced at a very early date in the country. The Romans worked iron extensively in the Weald of Kent, as we assume from the large heaps of slag containing Roman coins which still remain there. Coal, which was used for ordinary purposes in England as early as the ninth century, does not appear to have been largely used for iron-smelting until the eigthteenth century, though a patent was granted for smelting iron with coal in the year 1611. The use of charcoal for that purpose was not given up until the beginning of this century, since which period an enormous increase in the mining and metallurgical industries has taken place; the quantity of coal raised in the United Kingdom in 1873 having amounted to 127,000,000 tons, and the quantity of pig-iron to upward of 6,500,000 tons.

Convention of Railroad Purchasing Agents.

WE have received from the Secretary of the Association of Railroad Purchasing Agents of the United States and Canada, the following minutes of the proceedings at its second annual meeting held at St. Louis on the 12th and 13th of May last:

The following officers were elected for the current year:

President, W. S. Cuddy, St. L. & I. M. R. R.

First Vice-President, J. T. Sterling, T. W. & W. R. R.

Second Vice-President, A. C. Armstrong, L. S. & M. So. R. R.

Secretary and Treasurer, E. W. Porter, Canada So. R. R.

The Executive Committee consists of Messrs. G. C. Breed, A. V. Hartwell, E. V. Cherry, A. C. Armstrong and G. M. Babcock.

The President, on being conducted to the chair, addressed the convention as follows:

GENTLEMEN OF THE ASSOCIATION: The question has been asked, Of what use is the annual meeting of purchasing agents? We may with equal propriety ask, of what use are the meetings of railroad freight and ticket agents, conductors, editors, pork-packers, and millers? When two purchasing agents meet, there is almost invariably a long, close, confidential conversation, in which comparisons are made as to the manner and method adopted by each in his style of doing business, the description of blanks used on each other's roads, the best articles known to either for certain specific purposes, and the merits and demerits of certain kinds of goods offered for sale, or in use on their respective roads; thus information is gained that is beneficial to them as purchasing agents and which is used for the benefit of the roads they represent.

Now, the object of the Purchasing Agents' Convention, is to bring about in a pleasant and social manner, just such kind of meetings, only on a larger and more comprehensive scale, that we may know each other and mutually assist and strengthen each other in the discharge of the important trusts that are committed to our charge. If there were only as many merchants in the United States and Canada as there are railway

purchasing agents, say one hundred and fifty altogether, and these merchants were distributed as we are, only a few together in the larger cities, and the others occupying isolated positions at considerable distances from any other in the same business, and if such merchants were selling a great variety of articles, from the size of a tack to a steam excavator, and selling them all over the country, would not such merchants naturally desire to meet together for information concerning the details of their business?

Now we are not selling, but we are buying from all parts of our whole country, and we are as a general thing isolated from each other, ignorant of the customs and usages of our fellow workmen in the same important field, and hence the necessity of our meeting. Some persons object to our holding conventions because they think it may cause difficulties between the purchasing agents and the superintendents and master mechanics; that in discussing certain questions we might take different or antagonistic views, which would lead to unpleasantness. But with persons who rightly understand the motives that have led to our organization, such objections can certainly have no foundation. We do not propose to decide which is the best frog or the most reliable switch, or whether a fire-box is safer or more economical when made of homogeneous steel or iron. None of the questions which it is customary for a superintendent or master mechanic to decide, will be considered at our meetings, and therefore we can not see how we are to have trouble with these gentlemen. On the contrary, it being known that we meet as purchasing agents for the benefit of purchasing agents, the objects of our association will meet with the hearty approval and sympathy of the presidents and other officers of our roads.

WHEEL MILEAGE.

The discussion of the question of wheel mileage, and the contracts required of purchasing agents by their roads, brought out the following resolution, which was unanimously adopted:

Resolved, That this Association places its protest upon record against the present system of most roads, of reporting freight car mileage in aggregate, instead of reporting each individual car, thus preventing us from perfecting contracts for car wheels based upon actual car mileage; whereas, if reports were made between roads of mileage of each car, it would be an easy matter to determine by actual mileage the worth of a wheel, rather than by time, which may be unjust to either party to the contract.

Some statistics were presented in reference to the service rendered by car wheels of different makers; and reports were made of experiments with Ashcroft's machine. (?) These gave rise to interesting discussions.

The convention will be held next year at Cincinnati, on the 17th of May.

The Law of the Rail.

SOME one, who has taken the trouble to post himself on the law governing railroad passenger travel, says that extra charges for failure to buy tickets are universally sustained by the courts, but there must be a full opportunity to buy afforded by the ticket seller. Passengers must show tickets when asked for. As to stopping off, there is only one decision, which is that a passenger cannot stop off, and resume his journey, without the previous assent of the company. As to the obligation of the road to furnish a seat to a passenger, a decision says: "A passenger who exhibits his ticket need not surrender it until he has been furnished with a seat." A railroad is not liable for things stolen out of a passenger's seat, there being no previous delivery to the company's servants; for the same reason the company is not liable for baggage in the passenger's own care. Passengers who neglect to look after their own baggage on arrival at their destination cannot recover if it is lost without fault of the carrier. Baggage left in station houses for the passenger's convenience, after it has reached its destination, comes under a new class of rights and duties, the baggage master assuming the position of a gratuitous bailee, who only becomes liable in cases of gross negligence. The obligation of the railroad as carrier ceases when it has delivered it to its owner at the place of destination, or when he has had reasonable opportunity of receiving and removing it. It will interest sportsmen to know that they may recover for the value of dogs when they entrust them to baggage masters for hire because of their exclusion from the passenger cars.

Combustion of Coal in Locomotives.

As whatever relates to a more effective combustion and economical consumption of coal in locomotives is of special interest to all who are engaged in operating railroads, we give below an interesting extract from some "Notes" on the subject, prepared by a gentleman who has given it special attention on western roads, and whose views are based upon experiment and careful observation. The writer begins by presenting some facts and statistics on

THE COMBUSTION OF ILLINOIS COAL.

He says: An analysis of a ton of average Illinois coal, will show something like the following result:

Carbon.....	1600 lbs., or	80 per cent.
Hydrogen.....	100 "	5 "
Sand-Ash, etc.....	300 "	15 "

In the process of burning, 100 lbs. of hydrogen will unite with 300 lbs. of carbon, forming 400 lbs. of carburetted hydrogen or coal gas, which must be burned in that form. The combustible part of a ton of coal will then be as follows:

Solid carbon.....	1300 lbs.
Carb. hydrogen gas.....	400 "

the relative heating power of these products being as follows:

Carb. hydrogen 400 lbs.....	Hydrogen 100 lbs.—heating power	23.0	44.6
	Carbon....300 " "	21.6	
Carbon .....1300 lbs.....				93.6

From this we see that about one third of the heating power of the coal is in the volatile gases. In order to burn the combustible products of one ton of coal, atmospheric air is required as follows:

For 400 lbs. Carb. hydrogen, 7733.7 lbs., or 95,800 cubic feet of air.

For 1300 lbs. Carbon, 16,738.9 lbs., or 207,350 cubic feet of air.

Careful experiments made abroad and in this country, have shown that the quantity of air requisite to burn the hydro-carbons must be admitted into the furnace above the fuel; and that the best results have been shown when the air so admitted has been even in excess of the theoretical quantities above stated. Part of the air passing through the furnace without combining with the gases, accounts for the last mentioned result. These gases are in every case driven off before the coke or fixed carbon ignites. The stronger the draught of the furnace, the more rapid is the combustion of the coke and the greater the evolution of gas; but unless there are holes in the fire—which should not occur with careful firing—little if any air gets through to unite with the gases, and they consequently pass away unconsumed. These gases, which have nearly the same composition as illuminating gas, require an intimate mixture with common air to insure perfect combustion, and will not burn at all unless atmospheric air be present. This may be shown by taking a jar full of coal gas, with no mixture of common air with it, and upon applying a match, the gas will burn slowly on its lower edge as it gradually becomes mixed with the common air. If, however, the gas in the jar is stirred up so as to mix the other air with it, the combustion will be instantaneous and explosive. Perfect combustion is dependent upon the completeness of the mixture. In the combustion of coal, the gases are given out at a temperature high enough for ignition, and if they meet with common air will burn immediately. If, however, the gases rise and become cooled before such mixture takes place, some application of the requisite degree of heat—as by heated fire-brick—is necessary to produce combustion. The requisites for perfect combustion of the gases and prevention of smoke, may be summed us as follows:

1. The intimate mixture of the requisite quantity of air with the gases above the coal.
2. The necessary degree of heat for the ignition of this mixture.

COAL BURNING IN LOCOMOTIVES.

From the construction of a locomotive fire-box, the mixture of atmospheric air and the coal gases must be effected as soon and as intimately as possible, as all flames are extinguished upon entering the tubes. All gases not then consumed, pass away, and a portion of the carbon condensing, forms smoke. In stationary engine-boilers the flues are large, and afford more space in which to burn the gases in case the mixture is not quite perfect at first. The combustion is usually more perfect, as is shown by a larger number of pounds of water evaporated per pound of coal burned, than is the case with the locomotive engine. The usual mode of effecting the desired mixture of air with the gases in the fire-box is by having a number of small air-openings, or "hollow stays" as they are called, in the sides of the fire-box above the line of fuel. Experiments with the locomotive engine have given the best results when the total area of such openings was one fiftieth of the area of the grate surface upon which the coal was burnt. The smaller the openings are, the more perfect the mixture and combustion of the gases. The fire-boxes of a large number of freight engines are 5 ft. 6 in. long and 2 ft. 11 in. wide, and would therefore need 105 air tubes of $\frac{3}{4}$ in. diameter. The most economical of this class of engines, within the writer's knowledge, are some recently built by the Manchester Works, and in which the proportion of area of hollow stays to grate surface is $\frac{1}{54}$. An average of five of these engines for ten months, showed a consumption of 2.69 lbs. of coal per loaded car per mile; while an average of five engines of the same make and class, but with a proportion of hollow stays to grate surface of $\frac{1}{80}$, showed 2.74 lbs. of coal consumed per loaded car per mile. Experiments made with engines with plain boxes, but no hollow stays, showed an evaporation of 5.7 lbs. of water per pound of coal burned.

It has been found useful in locomotive fire-boxes to counteract the shortness of flame-way and promote the mixture of gas and atmospheric air, by employing a deflector, either in the shape of a brick arch or water-leg. Engines built upon this principle in England, have evaporated 8.7 lbs. of water per pound of coal burned, which is a higher figure than has been obtained in this country. The forms used, however, were expensive and would not be practicable with the severe service required of American engines. The deflector has also the following advantages:

1. The engine does not throw fire and cinders so badly, as a large portion of the coals lifted from the grate by the draught, are thrown back again by the deflector.
2. In case of "slipping" when the engine is working heavily, the fire is not torn up as is the case with the plain box. Tearing the fire allows large quantities of cold air to rush through the grates, which cools the tubes and reduces the steam pressure.
3. As the cinders and coals are kept from passing through the tubes, there is a saving in the wear of the tube ends, and also of the smoke-stack and netting.
4. The deflector prevents undue cooling and contraction of the flue-sheet when the fire-box door is open; such contraction in time loosening the tube ends and causing leakage.

The True Mission of Railroads in this Country.

BY J. M. BLANCHARD.

THE prevailing idea with many people seems to be that the true mission of our railroads is to enrich their owners, and that the best managed road is that one which yields the largest immediate returns in the form of dividends upon the stock of the company. That such mission includes a fair return upon the money actually invested in their construction, will not be questioned ; but that this is their highest and only purpose, is not admitted. It is their real mission to afford increased facilities and advantages to the people, and the best managed road is the one which does this most successfully, while at the same time a good profit is realized, and the good will of the public retained, for a series of years. They are also the means by which the masses of our population acquire that special education which can only be derived from traveling and a more extended intercourse with each other. The exchange of ideas as well as commodities is promoted at a comparatively small cost in money, and this should inspire the belief that the managers of railroads are the friends as well as the servants of the public. The want of this belief has been the source of much of the opposition to railroad corporations ; and it is important to determine where the blame rightly belongs, so that the roads may be exonerated if the opposition to them is unwarranted.

What then are the facts in reference to the construction and operation of railroads in this country? Can it be said that they have been built with the least possible expenditure? Any one who is at all familiar with the way in which some of these enterprises have been conducted, knows that such is not the case. Personal interests have in many instances been served to the detriment of the general good. Large sums of money have been expended during the inception and progress of roads, in excess of what should have been their legitimate cost, and the entire amount charged to construction and equipment, so that when put in operation the prices of transportation have been in proportion to the entire cost ; or, when this has not been done, the stockholders have had to suffer. I apprehend, however, that this is not the main ground of complaint with those who are hostile to the present methods of building and managing railroads, but that the objection is rather against the manner in which transportation charges are made in accordance with old methods of doing business. In fixing rates for both passengers and freight, it has frequently been the custom to charge as much as it was thought could be obtained, without regard to the interests of shippers, which is clearly a policy which thinking men not financially interested in our roads, will be slow to approve. It is also claimed that a proper discrimination is not made with respect to the value of the different kinds of freight transported. Let us suppose, for instance, that two merchants from some distant town in the interior, go to New-York to buy goods. One buys silks, velvets, and other costly goods of a like description, and the other calicoes, sheetings and domestics of a cheap grade, all of which are usually rated as first-class freight, and the same price per hundred pounds charged for transportation, notwithstanding one lot has cost and is worth ten times as much as the other, and while they are in transit the carriers are liable for their value in case they are lost or destroyed. This does not seem to a thinking man to be a right way of doing business, because the interests of the carrier are not properly protected, nor is it doing equal and exact justice to charge the consumer of the cheap fabrics ten times as much as the rich man is charged who buys the costly goods. It is proper to say that a discrimination of this kind has been tried by one of our leading roads, which as a matter of course sent all the costly freights to other lines that made no discrimination. To be worth any thing, it must be a general regulation adhered to by all the roads.

Another respect in which it is claimed that railroads fail to fulfill their mission, is in not having reduced passenger tariffs to such a complete system as to be able to determine what rate per mile will bring the largest returns to the road, and at the same time do no injustice to the passenger. It is claimed that the prices charged are as much as can be obtained, which is as unjust to the passenger as it is in the case of the shipper above referred to. Another prolific cause of complaint is the charging of greater prices per mile for short distances than for long ones, so that a person going 25 miles pays, say three cents per mile, while a through passenger sitting by his side, pays only two cents per mile for the same distance. This discrimination is apparently made against the wrong passenger; for as a rule, those who ride short distances patronize the roads more frequently. The neglect to run cheap trains for the convenience of the laboring classes, is another instance in which the great majority of roads fail to fulfill their mission. Upon all roads connecting important points, a cheap train should be run at least once a day, at a comparatively slow speed, and with comfortable cars well warmed and ventilated. The health of people in large cities would be greatly promoted by the transportation by night trains, of fresh milk and vegetables, and this should be done at prices barely sufficient to cover expenses. This may seem a strange kind of humanitarian movement for railroads to engage in, but the writer is firm in the belief that it would not only be humane but profitable, by making friends of a large class of people who are now inimical, or at least indifferent, to the interests of roads. As an evidence of the correctness of this view, and of the power of sympathy, it may be stated that the issuing of a free pass has sometimes secured the entire freighting business of large firms and taken it away from rival lines. The mere money value of the pass was not alone sufficient to secure the patronage, but the giving of it evinced a disposition to deal liberally and to recognize the fact that the parties were worth conciliating.

It should be the mission of railroads to facilitate the exchange of ideas and commodities. In a country such as ours, with its extended area and varied productions, it is important that future roads should be located with reference to future traffic and the development of the region through which they run. Suppose the Government were to aid in building a road through central Florida, affording an outlet for the products of the native orange groves, holding out inducements to settlers, and creating a market for its large tracts of fertile lands. Does any one suppose the benefits would be confined exclusively to the South? Would not the North indirectly participate in them in various ways not necessary to enumerate? A large portion of our peach crop has this year been permitted to rot in the orchards for the lack of transportation to distribute it over the country.

In conclusion it is proper to say that when a State charters a railroad, the citizens of the State concede something, and have a right to expect that the road, when completed, shall be managed so as to secure them a fair return for what they have relinquished.

The End-Play of Journals.

To the Editor of the National Car-Builder :

DEAR SIR : I have read with much interest the article on this subject contributed by Mr. Wells and published in your September number. In this article he says that the end-play of journals should not at the most exceed $\frac{1}{4}$ of an inch, even after the collars have performed their duty and worn into the brasses to a permissible extent. In a previous article published in the *Railroad Gazette*, and copied in your May number, he says " if boxes next the hub of the wheel are made *thick*, so as to allow for the wear of the hub in the end-thrusts of the wheels; and *close* enough, when new, to allow but $\frac{1}{8}$ of an inch lateral play between the box and hub, better results will be obtained than from the common practice." As no allusion was made in this extract to brasses, I supposed they were not referred to. I can not, however, see how any benefit is derived from wearing out the back part of the oil-box. The metal being softer and more exposed to the grinding action of sand and dirt, it will wear as fast if not faster than the brasses. In case of the wear of both boxes and brasses, after the first set of brasses is worn out, the key-seat undergoing no change, the boxes will have to be changed or else the brasses will take the end-play as stated in my communication published in your May number. As regards the box and wheel coming in contact, I once saw a car in which the brasses did not take the end-play, and which was consequently taken by the boxes. The car run 65 miles and returned, and burnt out or destroyed 13 brasses and 2 journals ; then a new key-pattern was made to remedy in part the defect in the box-pattern, and there was no further trouble. I have kept up two styles of cars, one with a $\frac{1}{4}$ inch clearance between the wheel and box, and with about $\frac{3}{8}$ inch end-play when the brasses were new ; and another with $1\frac{1}{8}$ inch clearance between box and wheel —more, I think, than is necessary. The first named cars have caused a great deal of trouble in keeping the truck-frames square, there have also been many straight flanges, and many changes of boxes. The boxes, however, were not as heavy as Mr. Wells would recommend—in fact, they were light. With the other style of cars with a clearance of $1\frac{1}{8}$ in., there has been no trouble in keeping the frames square, not one straight flange to ten in the first named style, and no boxes to change except in case of a wreck. The trucks of both are of the same dimensions, and if there is any thing to favor either, it is that the transoms of the first named are an inch wider, into which the top arch-bars are let, thus giving them 10 inches more bearing to prevent the trucks from being knocked out of square.

I do not desire to be understood as recommending $\frac{1}{2}$ an inch play for each brass. What I think would give the best satisfaction are journals $\frac{5}{16}$ of an inch longer than the brass key-seat in the box—$\frac{1}{4}$ inch longer than the key—or if the key is formed in the box, have it a $\frac{1}{4}$ inch shorter than the slot in the brass, to allow for the roughness of castings ; then build the frame as wide as the length of axles from center to center of journals. This will allow the wheels when they are at one side, to move $\frac{1}{2}$ an inch towards the other, that is, when the excrescences are worn off the key and key-seat, which will not take long. I heartily agree with Mr. Wells in not allowing too much end-play, and also in carrying the weight as nearly over the rail as possible.

In the many cars that have come under my observation, of different styles of construction, I have noticed that a very considerable number were defective in the following particulars :

1. Too much play between the brass and the side of the box, which prevents a ready adjustment of the truck to the track when passing a curve, the axles not being parallel with the radial line.

2. Receiving the end-play of the wheel upon the inner or outer ends of the brasses, instead of having the boxes, brasses, keys and frame so constructed as to receive the shock on the inside collar at one end, and on the outside collar at the other end of the same axle, at the same time.

3. Making the core-boxes so as to leave $\frac{1}{4}$ inch of metal on one side and $\frac{3}{4}$ inch on the other, and this not only in the bottom of the box but in the key-seat also. When such boxes are put in a square frame, the axles will be parallel and will adjust themselves to the curve, but the frame will not coincide with the car body.

4. Instead of making the box pattern so the center of arch-bars will come over the center of journals, it is frequently $\frac{1}{2}$ an inch towards the inside or outside end. The consequence is that if a single brass is changed it gets hot and continues so until it is worn or cut down to correspond with the other brass on the same side of the truck.

5. Another glaring defect, as it seems to me, is the leaving of a 5-inch opening in the inner end of the box when the wheel-seat is only 4¼ or 4½ inches (unless the standard axle is to be used some time in the future) as it only facilitates the waste of oil; also the practice of having a vertical opening so that when the brass and key are in, there is 1¼ inch clearance below the axle, and only ¼ inch above. It would in my judgment be better to have just enough below to permit the brass to be taken out, and enough above to allow the brass to wear out by the time the box would touch the axle, as I can see no use in buying castings to create friction and wear out in this way, for if the journals will carry the weight at one time they will at another. This has not by any means been overlooked by all car-builders, but it has been by some, who seem to think it sufficient to have an opening large enough to get in a brass, without considering whether it throws the wheel forward or back, causing flange-wear and other injurious results.

JAMES G. THAYER.

ATCHISON, KANSAS, Nov. 1875.

Interchange of Cars.

AT a meeting of the representatives of many railroads in the United States and Canada, held at Niagara Falls on the 26th October, for the purpose of fixing more just and uniform rates of charges for repairs made to foreign cars, it was unanimously resolved to recommend the following:

1. That old wheels shall not be used for repairs of foreign cars when charges are made.

2. That wheels removed for other causes than *being broken*, may be replaced by second-hand wheels, *without charge*, other than $1.50 per wheel or per pair, for labor of refitting.

3. That the price of one new wheel (less old wheel) shall be $12.50, and for two new wheels (less old wheels, and on original axle) shall be $23.50, labor included.

4. That wheels wearing loose from defective fitting, $1.50 each, per pair, shall be charged to company owning the car for refitting the same.

5. That for material used in repairs of cars of the different companies, each company shall furnish the same at cost, with an addition of 15 per cent to labor only, for shop expenses, &c.

6. That 3½ cents per pound be the uniform price for interchange of iron castings.

7. That one railroad company rendering bills against another for wheels or axles, *shall note on bill* the manufacturers' name and date, also the railroad companies' marks on wheels and axles, with number of car and date of removal.

C. E. BENTON *Chairman*,
Canada Southern Railway.

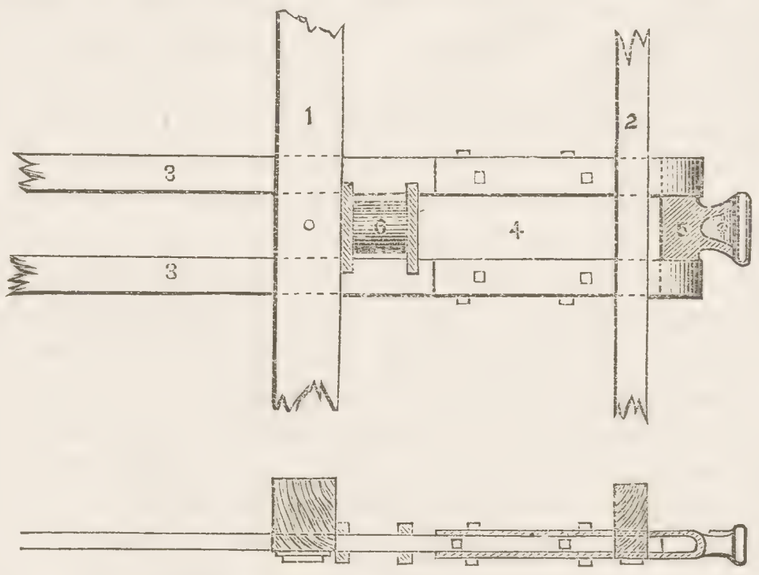
JOHN KIRBY, *Secretary*,
L. S. & M. S. Railway.

THE Chicago and Northwestern Railway car shops in the suburbs of Chicago are now so nearly completed that they will be in running order within thirty days. A new boiler shop for the locomotive department has just been finished. This department will employ 400 men. The old car shops in Chicago will be abandoned. The company is now building two baggage cars 40 feet long, with 4-wheel trucks, and one 50 feet long, with 6-wheel trucks; also a 46-foot passenger coach.

THE Hannibal, Mo., shops of the Hannibal and St. Joseph R. R., are repairing several Pullman and ordinary passenger cars, and also rebuilding a number of coal cars. The master car-builder, Mr. J. Townsend, is replacing old oil-boxes with larger ones, and increasing the size of journals, by reforging, from 3¼ x 6 to 3½ x 6. The "M. C. B." standard is adopted for all new trucks. Within the past two months 130 pairs of new wheels have been put into service. The shops are also undergoing needed repairs.

A Continuous Draw-Bar.

THE cuts represent a plan and section of a continuous draw-bar attachment which has been in use several years on some of the Southern roads. The cars upon which it is used have only four longitudinal sills; the outside ones are 5 x 12 and the inside ones 5 x 8 inches, the spaces between them being equal. Between the inside sills are placed the two continuous draft-timbers (3) (3) which are gained into the under side of transom (1) and end-sill (2) flush, and held there by straps of iron or wood bolted to the transom and sill. The size of the draft-timbers is 4 x 6 inches; they are placed 10 inches apart, with their 6 inch sides up. Between them is a hard-wood block (4) extending from the cast iron draw-head (5) to the spring follower. This follower, which is 2 inches thick and 8 inches wide, has 2-inch shoulders which rest and slide upon the draft-timbers. Behind it is a rubber or steel buffer spring 6½ x 8 inches. The draw-head fits with a pocket to the end of the block, and has shoulders on each side which are held to the draft-timbers by ⅝ x 4 inch straps of iron. These timbers being continuous from end to end of the car, and being free to slide under the transoms and end-sills, the drawing and buffing strains are consequently sustained by the transoms in connection with the springs resting against them, the pulling being from the rear transom and the buffing against the forward one, thus preventing the timbers from buckling under concussion. The advantages of this arrangement are, that the center-pins are left free to be taken out from above, and that only two intermediate sills are used instead of four. The transoms are of course heavier, but they would safely bear a reduction of from two to four inches in width; the end-sills could be tapered from the center to 8 inches at the corners, and the side-sills in the same way forward from the transoms.



A correspondent who sends us the above, says that this plan is not a new one, and is believed to have originated with the Tredegar Works, at Richmond, Va.; but having seen it in use on the Texas Pacific and some other Southern roads, he thinks a description of it may be of some interest to Northern car-builders in view of the general desire for some improvement upon the ordinary method.

Economy in Machine Shops.

THE following suggestions in regard to the care of tools and waste of oil in machine shops, are contained in a paper read before the New-York Society of Practical Engineering, by James C. Bayles, editor of the *Iron Age*:

"The proper care of tools is always attended with an important economy. In small establishments this seldom receives due attention. As a rule, a tool belongs to anybody who happens to have it; consequently, no one is responsible for it. It is neglected, abused, mislaid, broken, stolen, or worn out before it has rendered half the service it is capable of performing. In some shops the time of one man, and sometimes two, is constantly lost in looking for missing tools and putting them in order for use when found; and a great deal of capital is wasted by the premature destruction of tools which with proper care should have lasted for years. In all manufactories there should be a place for tools not in constant use, and some one should have charge of them. A very good system, which I have always found to work well, provides for the charging of every tool in use to the man using it. When it is returned he receives a credit for it which balances his account with the tool department. For tools added to his individual 'kit,' such as files and other implements supplied by employers, charge is made and no credit is given until the tool is returned broken or worn out, when a credit entry is made with date, showing how long it has been in use. Such a record induces men to be careful of tools, and, by inculcating good habits in this respect, leads to economy in a direction in which waste and extravagance are easily overlooked.

"Another important saving in many shops would attend a more judicious oversight of the consumption of oil. In machine shops, and, to a greater or less extent, in all shops where machinery is used and iron worked, the amount of oil wasted constitutes a very large proportion of the total amount used. This waste results from a certain looseness of habit which most men acquire in handling materials which some one else pays for. When a drop of oil is needed, it is customary for the mechanic to pour a stream from his oil can, and wipe off the surplus with a wad of cotton waste. It is no exaggeration to say that half the oil used about many manufactories of machinery and metal goods is wasted, and this waste constitutes a serious item of expense. Oil is almost always used exclusively for lubricating purposes, especially in small establishments, yet there are other lubricants that might be kept constantly on hand, which are at once much cheaper and much better than oil for such purposes as drilling, tapping, screw cutting, etc. There is also a great deal of oil wasted in applying it to machinery and shafting, Whenever we see a drip pan that has not been attended to for a few days, we may be pretty sure of finding it half full of oil which has rendered no service, and which has become unfit for use, being gummy, foul, and filled with foreign impurities. There is no need of this waste, which never occurs when the oiling of the shafting and machinery is properly looked after, but it is an evil against which the manufacturer can guard only by constant watchfulness."

MR. JOHN MCCOY has been appointed Assistant Superintendent of the Northern Division of the Pullman Palace Car Company, in place of A. R. Winfield, resigned. Col. Charles Ball succeeds H. B. Latrobe as Superintendent of the Southern Division.

ON the 9th of November, the feat was attempted of running a train over the Pennsylvania Railroad from Jersey City to Pittsburg, a distance of 444 miles, at a speed of 45 miles an hour, without stopping. The train consisted of two passenger cars, one baggage car, and engine 573 of the Pittsburg Division. The run was very successful until the train reached Pomeroy Station, 45 miles west of Philadelphia, when Mr. C. S. Douglass, assistant engineer of the middle division, while leaning out of the train to examine an oil-box, was struck on the head by a projecting roof and instantly killed. This untoward occurrence prevented the accomplishment of the feat. Another attempt will be made early in December.

SIXTEEN new drawing-room and sleeping coaches are being built by the Wagner Car Company for the Michigan Central Railroad. Six hotel cars are also in process of construction, three of them being nearly completed.

THE Wason Manufacturing Company at Springfield, Mass., is building 20 box cars for the Connecticut Western, and 12 passenger cars for the New York, New Haven and Hartford. Twenty-five coal cars have just been shipped to the Rhinebeck and Connecticut road.

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Editorial Announcements.

CORRESPONDENCE.—*We cordially invite the co-operation of the railroad public in affording us the material for a good mechanical paper. Articles relating to rolling-stock and machinery, by those practically acquainted with those subjects, will be gratefully received. All communications must be addressed to Vose, Dinsmore & Co., No. 32 Warren Street.*

ADVERTISING RATES.—*For one square, or one fifth of a column, $5 per month, or $50 a year. For half a square, $3 per month, or $25 a year. Larger advertisements by special contract.*

All communications in regard to advertising should be addressed to L. F. DINSMORE, *Post-Office Box* 4055, *New-York City, who is our agent for advertising, and authorized to make contracts, collections, etc.*

ENGRAVINGS AND ILLUSTRATIONS.

We would invite the attention of Master Car-Builders and others to the advantages to be derived from publishing in THE NATIONAL CAR-BUILDER *engravings designed to illustrate the various features and details of car construction, and especially such improvements as can not otherwise be clearly presented. We will procure cuts to be made in the best manner from drawings or models that may be sent us, and charge only for the cost of engraving, inserting the same in our paper with suitable descriptive details, without charge.*

Light Cars and Cheap Transportation.

THE burden of talk just now among commercial and business men and in railway and engineering circles, relates largely to the question of cheap transportation. A great many ways are suggested by which some permanent reduction may be brought about in the cost of carrying freight on railroads. Prominent among these are improved terminal facilities and a better adaptation of rolling-stock to the character of the products to be transported, with the view of securing a more uniform tonnage and a consequent saving of expense in the hauling of empty cars. Many minor economies are also suggested, tending to diminish the cost of labor and the general wear and tear in the details of operation. It seems to be conceded, however, by railroad mechanics of the largest experience and best practical knowledge, that a reduction of the present weight of rolling-stock—more particularly that of freight cars—is one of the most important elements involved in the problem of cheap freights. Or, to put it in another way: the weight of the cars must be diminished, or their present carrying capacity increased without increasing their weight. Less dead weight must be hauled, and in order to accomplish this, there must be some improvements in construction. It is generally if not universally admitted by car-builders, that the ordinary 10-ton box car, which is supposed to carry on the average 11 tons of freight, is too heavy and ought to be made lighter, without any reduction of its capacity or durability. This is not only admitted, but the practicability of such a reduction has been proved and placed upon record. Specimen light cars have been built at different times and at various places, and if the testimony of the builders is worth anything, they have been put upon the track, and worn out without exhibiting any noteworthy defects, and leaving a highly satisfactory record of service; but strange to say, they seem to have had a lonesome life of it, and after dying a natural death, are no more heard of except upon special occasions, when their virtues have been recalled and dwelt upon as something peculiarly worthy of imitation.

Many years ago, as we have heard stated upon good authority, some of the shops of the Pennsylvania Railroad were set to work to construct a model car of this description, each shop in a laudable spirit of rivalry doing its best. The result was a car—which we suppose was the best of the lot, and as near a model as the nature of the case would permit—28 feet long, 8 ft. 6 in. wide, and 6 feet high, with very light trucks, and weighing altogether only 14,300 lbs. Its capacity, we believe, was estimated at 10 tons. It ran eight years, and required no more than ordinary repairing. A specimen light car was also built a few years ago for the Erie Railway, and the last we heard of it, it was doing excellent service. Others have been built with like good results, according to current report; and the opinion has been repeatedly expressed by competent car-builders, that freight cars could be made, weighing only 17,000 lbs. or thereabouts, which would be just as good in all respects as those weighing 21,000; and that even if such cars were more liable to injury in a smash-up, it was better in an economical point of view to incur such liability, than to haul the extra dead weight with its burden upon the track and motive power.

Now the question naturally arises, why have not more of such cars been built? Why has not the trail been followed up? Were these cars in advance of the age, or too good for ordinary every-day use, or too much of an innovation to secure the approval of conservative or over-cautious managers, or were they one and all inherently defective? It is quite certain they have not been duplicated to any extent, and we suspect the reasons are not very difficult to surmise. In spite of the admitted necessity and manifest advantages of lighter cars, there is a powerful under-current of prejudice against them, or rather a distrust of their capacity to meet the actual requirements of traffic. The growth of railroads in this country has been attended with a corresponding increase in the weight of both cars and engines, in order to run heavier and faster trains. The two factors are inseparable; one necessitates the other. Increased momentum requires increased power of resistance. To mix light cars with heavy ones would be like herding lambs and wolves together; the light cars, unless exceptionally well and strongly built, would be badly crushed. If the present freight equipment on all our roads could be uniformly reduced 15 or 20 per cent. in weight, without diminishing its carrying capacity, there would doubtless be a great saving in expense. But if, as would likely be the case in such an event, the trains would have to be shorter and lighter, as well as more numerous and requiring more engines, the saving would on this account be reduced to a very small figure or altogether neutralized.

The advantages claimed by the advocates of the 3-foot gauge system, as shown in their reports and estimates, have a very seductive appearance, and naturally suggest the inquiry why the same ratio of dead and paying weight can not be maintained upon the broad or standard gauge. It is said that the contents of 16 standard gauge cars can be transferred to 20 narrow gauge cars of the Denver and Rio Grande road, the total weight of the 16 loaded cars being 296 tons, and the total weight of the 20 cars, with the same load, being only 220 tons, showing a saving of 76 tons in dead weight—the 20 narrow gauge cars being 76 tons lighter than the 16 wide gauge ones. The paying load in both cases is 160 tons, and the question is suggested, how much sooner will a 3-ton narrow gauge car go to pieces from concussion and straining, than an 8½ ton car, the weight of load and length of train being the same? or the narrow-gauge train, as is probable in this case, being the longest. From this it is readily seen that there are in this comparison some vital conditions which do not appear on the surface, otherwise it would be a virtual settlement of the dead weight problem in favor of the narrow-gauge theory.

Upon standard gauge roads it may be questioned whether any material reduction in the weight of trucks and the floor-framing of cars is practicable with the present weight of trains and engines. The reduction must be mainly confined to the sides, ends, and roof. The wood and iron which go into cars are so varied in quality, and in their capacity for resisting different kinds of strains, as to afford a wide range for selection as well as discrimination in their use. A builder who is mainly bent on making his cars strong, is apt in the choice of materials, to regard the weight as of secondary importance, and the result is that what is gained in strength is, in an economical point of view, neutralized by an excess of weight; while on the other hand, if lightness is the principal thing aimed at, the requisite strength is apt to be overlooked. While it is evident that the present weight of cars will admit of some reduction without impairing their strength and efficiency, there are other things aside from mere weight by which the cost of transportation may be lessened. These may be indicated by the general term, "careful fitting," which includes well fitted axles, round, well mated wheels, square trucks, easy springs, good side motion, good lubrication, and a perfect adaptation of every part to every contiguous part, thus relieving the motive power of an enormous tax, avoiding delays and a thousand incidental drawbacks. Some trains pull as hard as a cat by the tail, when the difficulty is all owing to three or four badly fitted wheels, or trucks out of square. It is the minor economies which tell in the aggregate; look closely after these and the problem is solved.

Master Mechanics' Eighth Annual Report.

WE received too late for notice in our last issue, a copy of the eighth annual report of this Association. It is a neatly printed volume of 220 pages, and contains the reports of committees and discussions upon the various subjects presented at the meeting held in this city in May last. There are a number of tabular statements embodying valuable information in regard to wheel mileage, narrow and broad gauge rolling-stock, consumption of lubricants, etc.; also illustrations of water-tank construction, and Roberts' double exhaust cylinder for locomotives. The discussions are very fully reported and occupy nearly half the volume. They are printed in smaller type than the other portions, and contain the views and practical experience of some of the best railway mechanics of the country upon the construction and management of locomotive boilers, the purification of feed water, continuous train-brakes, locomotive tires, car axles, etc. The continuous investigation of these and kindred topics pertaining to railway operation, and the yearly record of the results of such inquiry, have made the transactions of the Association widely known and appreciated both in this country and abroad. The report as a whole is worthy of the careful attention of railroad men, and especially of those more immediately connected with the departments of locomotive construction and repair. The discussions will be found exceedingly interesting and instructive, and the reports of committees equally so, in spite of the chronic indifference with respect to furnishing information in reply to circulars so often complained of.

There is one thing in the printing of this report which strikes us as a defect, although it may not be so regarded by the majority of readers; and that is the use of words instead of figures to express numbers. This is almost invariably the case in the discussions. Where such frequent mention is made of capacities, weights and dimensions, it strikes us that figures would not only catch the eye much more readily, but would economize space, and be more easily comprehended and retained in the memory.

The June CAR-BUILDER contained a brief abstract

of the proceedings, which necessarily conveyed but an imperfect idea of the scope and spirit of the discussions, as well as of the information embodied in the reports of committees. This was more especially the case with reference to the report and discussion upon Continuous Train Brakes, and we now give in our present issue something more of what was said on this subject, as having a special interest for car-builders.

Palace Hotel Coaches.

THE Erie Railway Company have been running, since the first of November, daily trains between New-York and Chicago, to each of which is attached one or more of Pullman's palace hotel coaches. The rest of the train consists of the latest improved Pullman wide drawing-room and sleeping cars, and also new and elegant day coaches, all of which go through to Chicago without change, the car bodies being transferred to standard gauge trucks at Cleveland. The route from here is over the C. C. C. & I. Road to Shelby, and from thence to Chicago by the Baltimore and Ohio. There is a special agreement with the managers of these roads that the trains of the Erie and Chicago Line shall be run without interruption. The hotel coaches especially are becoming very popular, and the officials of the road are enthusiastic over the success of the enterprise. These coaches are divided into two compartments, in one of which the cooking is done; the other, which comprises much the larger portion of the car, is used for sleeping purposes, and is so well separated from the kitchen as to be quite free from any unpleasant odor. Oval bills of fare, elegantly bordered with silver, are distributed through all the first-class cars, and waiters pass through occasionally to receive orders. The edibles embrace every variety to be found at the best hotels, and to these is added a full wine list at first-class city restaurant prices. The order being given, the waiter adjusts a movable table in the compartment of the person wishing to be served, and in a few minutes brings in from the hotel car, in a covered tray, the various dishes asked for. In fact, meals may be enjoyed at forty miles per hour, with the same comfort and at equally cheap rates as at any hotel in the city that is conducted on the European plan.

THE Brooks Locomotive Works, at Dunkirk, N. Y., have received an order for eight additional locomotives for the Erie Railway, which, with the previous contracts on hand, will insure work until April for the force now employed. During the long depression which has prevailed in locomotive building, these works have kept running, although at a loss, in order to give employment to their men, and they have now six engines on hand which were built for the purpose of giving work to the men until contracts could be secured. Although the above order will not increase the present force in the shops, it will give steady work during the winter to the force now employed.

THE Michigan Commissioner of Railroads reports the equipment of the various roads within the State as follows: 1358 locomotives of all sizes, and a total of 31,254 cars; of which there were 604 passenger cars, 262 express and baggage cars, 14,667 box freight cars, 7298 platform cars, and 8476 ore and other cars. Of locomotives equipped with the air-brake, there are 125, besides those of the Lake Shore and Michigan Southern, where all passenger trains are thus furnished. There are 482 passenger cars thus equipped. The Westinghouse air-brake is in use on fourteen roads, and the Ward air-brake on seven, while the Chicago, Detroit and Canada Grand Trunk Junction, uses the Smith vacuum brake. Six roads still use the common hand-brake, their general business being done mostly by mixed trains.

SEE Alphabetical Index to Advertisements, on second page of cover.

Car-Builders' Monthly Meeting.

THE regular monthly meeting was held at the Association Rooms on Thursday evening, November 18. The President announced that the subject for discussion would be

DRAW-BARS, BUFFERS AND COUPLINGS,

this having been substituted for the Fitting of Wheels and Axles, which was the subject announced at the last meeting, for this evening, but which has been deferred until this month (Dec.), when Mr. Coleman Sellers, of Philadelphia, is expected to be present and deliver an address.

Mr. W. E. Partridge then read a paper which he said had been very hastily prepared, owing to short notice and lack of time for giving the subject the attention it deserved. He began by referring to the early method of coupling cars on the Mohawk and Hudson Railroad. It consisted of three chain-links, but with no provision for buffing, which compelled the passengers to resort to the use of fence rails inserted between the cars to break the force of concussion. Next followed the draw-plank with its flimsy attachment, which answered very well for the light cars formerly used, but as the length of trains and the size and capacity of cars increased, the increased strain required a stronger and more effective apparatus. The original difficulty, however, had not been entirely overcome by any of the devices since employed, including even the best of those now in use. The problem was one which still continued to vex the minds of railroad men. To examine all the essential points involved in the case, would take more time than could be devoted to it in a single evening. He could only notice some of the most prominent ones.

The present method of attaching, or more properly *hanging* one car to the end of another in making up trains, was radically wrong, because the longer the train the greater the strain upon the forward draw-springs, until their elasticity was exhausted and they became virtually no spring at all; and breakages of links, pins, draw-bars, etc., are the result. The remedy for this is obviously a continuous drawing attachment that will fairly distribute the strain so that each car can always be drawn by its own spring, without regard to the number of cars in a train. Each spring being adapted to the weight of its own car, does its own proper work and no more, with no risk of overloading. The nature of the problem may be illustrated by placing a given load upon a number of springs, set side by side on the ground, and then placing the same load upon the same springs set vertically one above another. In the latter case, the lower springs would suffer most, and the lowest one most of all. There are many obstacles, however, in the way of a continuous draw-bar; one of these is the method of floor-framing in use, and another is a prevailing conservatism adverse to innovation. Links and pins are seemingly the cheapest and most convenient devices for coupling, and for this reason have acquired and still retain an undeserved popularity. The average weight of both is 12 or 13 pounds, and if the number lost upon the leading lines of road could be correctly ascertained, it would be almost incredible. The loss, however, is pretty fairly indicated by the quantity made, and this on some of our principal roads having through connections, is equal to a consumption of 25,000 lbs. of iron per month. The loss resulting from the various breakages caused by violent buffing, is more than railroad men fully realize, because they are used to it. It forms a large portion of the aggregate repairing.

In this country center buffers are almost universally used, while side buffers are preferred upon foreign roads. The former method has great advantages over the latter. When the side-buffers are in contact, and the train under compression, there was great resistance in curving, the action of the springs tending to keep the train in a straight line. Our trains are rarely under compression when coupled, and the center buffers, whether in contact or not, offer little or no resistance in curving, and they are also more in the direct line of resistance. In some of our older freight-cars the buffers, although central, are so much below the floor frame that there is danger of breaking the draw-timbers and fastenings when the train "shuts up." The old draw-plank crops out in this method, and it is no unusual thing to see cars constructed in this way; if they happen to get into a long train, however, they seldom pass the next repair shop, and so their number is rapidly diminishing. It is a well established principle that in the transmission of strains the direct line is the best one, as this coincides with the line of greatest resistance; and if universal practice had not combined draw-bar and buffer, the best place for the latter would be on a level with the end-sills, and then the whole strain would be directly on the floor timbers. As it is, the only way is to raise the bar as nearly as possible to a line with the center sills. Much breakage occurs from making draw-bars of inferior metal. Good cast iron, and plenty of it, is vastly better for this purpose than poor and light wrought iron; while a heavy wrought bar made of good stock, will do splendid service. Cheap draw-bars are popular, but they do not pay because the requisite strength can not be had at a Cheap John price. While we are trying to make our cars lighter, it should be borne in mind that the strength of some parts has relation more to the weight of the train than to that of the car to which they belong; and the draw-bar is one of these. The best test of their capacity is a good square butting collision at a fair maximum speed. In such case the good ones will clean out the poor ones, and also test the strength and quality of the attachments—timbers, bolts, etc.

Mr. Partridge submitted several estimates made up from the records of car repairs upon different roads at various times, showing that broken drawing attachments constitute a very large proportion of the ordinary repairs, and more than one half of the injuries which directly involve the safety of cars.

Mr. F. D. Adams said the committee in charge of this subject had made up their minds in regard to some points in which drawing attachments were defective, but were not yet prepared to recommend any thing in the way of improvement. No plan would be perfect that did not do away with links and pins; and it was also absolutely necessary to have a greater range of spring motion, and the resistance in a more direct line. He had seen but two or three models as yet which dispensed with links and pins, but they did not fully come up to what was wanted. He thought there should be separate buffers. Inventors seem to think that self-coupling was the only essential thing to be provided for; they lost sight of the fact that we did not always want cars to couple when they came in contact. He thought some progress was being made, and that some satisfactory plan would ultimately be adopted, but it must be of such a nature as not to prevent the use of our present stock of draw-bars; we could not afford to throw that away.

Mr. W. E. Chamberlain said he thought we were asking a good deal of inventors. We wanted to dispense with links and pins; we also wanted a separate buffer and automatic coupler, and at the same time use our old stock. To do all this was manifestly impossible. The old draw-heads could not be used with new devices which must be entirely different in order to meet the required conditions. He thought there could not be any great trouble in getting up an automatic coupler if we could get rid of the old draw-bars.

Mr. Adams inquired why car-builders didn't get up something to suit themselves. They were very seldom inventors; and the reason doubtless was that there were obstacles in the way of arriving at mechanical results of this kind which their practical experience enabled them to see and appreciate, but which the mere inventor knew nothing of; he would mature his invention, bring in his model, and wonder why it wouldn't work, when the real difficulty had

never been understood by him. He would venture to say that of the 1000 patents, more or less, that had been granted for coupling devices, at least 950 of them were worthless. As long as the present line of draft, below the car-body, was adhered to, we could not have automatic coupling.

Mr. D. A. Hopkins referred to a draw-bar used twenty years ago on the Erie Railway. The bar was of wrought iron, upset at the outer end and the head cast on; it had a wide mouth and narrow neck, and took the link at an angle of 45 degrees up or down. It was a perfect self-coupler, was cheap, durable, and never failed, but did not provide against loss of links and pins. It was abandoned because of some defect in the making, aside from the merits of the device.

Mr. C. E. Garey, of the New-York and Harlem Railroad, said he had kept an account of the waste or actual loss of links and pins on his road for the year ending Sept. 30, 1875, which he was almost afraid to present, in view of the statements that had been made; but it only amounted to $3.50 per car for the time named.

Mr. E. Varney, of the Fitchburg Railroad, thought the "Spooner," or National Freight Car-Coupler, [see April CAR BUILDER, 1875] with spring buffer-blocks on end-sills, so placed as to come in contact just before the draw-spring is exhausted, was the best arrangement until a better one could be devised. The double mouth of the draw-head insured the coupling when cars were of different heights, and the pin dropped automatically in place without the necessity of any one going between the cars.

In the course of the evening models of automatic couplers were exhibited and explained by the following gentlemen: Mr. T. B. Stevens, of Cleveland, Ohio; Mr. Henry Dutcher, of Port Jervis, N. Y.; Mr. R. Y. Townsend, of Wilmington, Del.; and Mr. Eaton Stone, of New-York City.

Chilson's Cone Disk Car Stove.

THIS stove is specially designed for the warming of passenger cars. The upper half or radiating part, is conical, upon the top of which is a large horizontal disk, which intercepts the heated air in its natural upward movement and throws it out around the stove to a considerable distance, thus far tending to keep the lower part of the car comfortable. The taper of the cone, aside from its radiating properties, has the effect of promoting a more thorough combustion of the smoke and gases, by holding them longer in contact with the fire. The pattern of the stove is elegant and tasteful, and its construction substantial and durable. Around the center is a guard-rail; the doors are securely locked; there is no hearth or other projection for dirt to lodge upon; and it is strongly bolted to the floor by rods extending from the disk at the top to the feet and through the floor to the nut fastening underneath. It is economical in consumption of fuel, and can be used a long time without repairing. It is also equally well adapted to steamboats, station-houses, factories, etc. Sale warerooms, 99 and 101 Blackstone street, Boston.

IT is said that of the 30,000 cases in law and chancery, for the past year, in the courts of Great Britain, but eight were patent cases; while in the United States, the records of the patent-office show that of cases officially concerning the bureau, there are upwards of 10,000 per year. But there are thousands more, and if regard be had to their magnitude, and the enormity of the fees, costs and expenses therein, the litigations growing out of infringements of patents, excluding those in which the patent-office has a hand, constitute the heaviest class of controversies regularly arising in our federal courts. Add to this, the fraud, perjury, subornation, and, above all, the injustice so often lamented in the final results of that most harassing and costly kind of litigation, and we have a conclusive proof of the error in our system.

Wear of Journal Bearings.

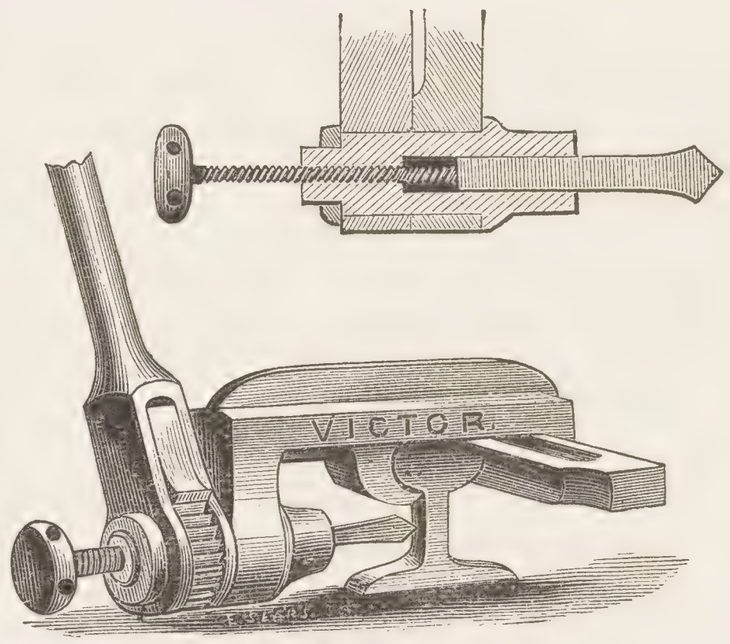
MR. W. E. CHAMBERLAIN, master car-builder of the Boston Division of the Boston and Albany Railroad, has been keeping a record of the wear of journal bearings of different kinds under his cars, and makes his first report in the following form:

REPORT OF JOURNAL BEARINGS $3\frac{3}{4}$ x 7 IN.

Kind of Bearing.	No. of bearings.	Original weight of bearings, lbs.	Miles run.	Worth of bearings when put in.	Weight of bearings when taken out, lbs.	Weight lost, lbs.	No. of miles run per oz. worn out.	Worth of bearings when taken out.	Cost of running.
Babbitt	12	10.4	33,195	$2.46	6.10	3.10	$572\frac{19}{25}$	$1.52\frac{3}{8}$	$0.93\frac{19}{16}$
"	17	8.14	27,463	2.13	5.8	3.6	$508\frac{31}{54}$	$1.26\frac{1}{2}$	$0.86\frac{1}{2}$
"	48	10.2	19,876	2.43	6.8	3.10	$342\frac{40}{58}$	$1.49\frac{1}{2}$	$0.93\frac{1}{2}$
"	52	9.8	27,743	2.28	5.15	3.9	$486\frac{41}{57}$	$1.36\frac{9}{16}$	$1.06\frac{7}{16}$
"	91	$10.6\frac{1}{2}$	31,874	$2.49\frac{3}{4}$	$6.4\frac{1}{2}$	4.2	$482\frac{62}{66}$	$1.44\frac{15}{32}$	$1.05\frac{5}{16}$
"	95	$8.12\frac{1}{2}$	21,478	$2\ 10\frac{3}{4}$	$5.8\frac{1}{2}$	3.4	$413\frac{2}{52}$	$1.27\frac{7}{32}$	$0.82\frac{13}{16}$
"	121	$10.1\frac{1}{2}$	25,963	$2.42\frac{1}{4}$	$6.10\frac{3}{4}$	3.7	$472\frac{3}{55}$	$1.53\frac{1}{32}$	$0.89\frac{11}{16}$
Total		68.½	187,592	$16.32\frac{3}{4}$	43.½	25.		$9.89\frac{23}{32}$	$6.43
Lead lined	9	9.12	68,982	$2.92\frac{1}{2}$	5.1	4.11	$919\frac{57}{75}$	$1.16\frac{7}{16}$	$1.76\frac{1}{16}$
" "	15	9.14	60,436	$2.96\frac{1}{4}$	6.9	3.5	$1,140\frac{16}{53}$	$1.50\frac{15}{16}$	$1.45\frac{5}{16}$
" "	20	9.12	55,783	$2.92\frac{1}{2}$	7.	2.12	$1,267\frac{35}{44}$	1.61	$1.31\frac{1}{2}$
" "	28	9.8	62,896	2.85	4,14	4.10	$849\frac{70}{74}$	$1.12\frac{2}{16}$	$1.72\frac{14}{16}$
" "	68	9.10	65,923	$2.88\frac{3}{4}$	5:5	4.5	$955\frac{28}{69}$	$1.22\frac{3}{16}$	$1.66\frac{9}{16}$
" "	72	$9.9\frac{1}{2}$	58,794	$2.87\frac{13}{16}$	$5.12\frac{1}{2}$	3.13	$963\frac{51}{61}$	$1.32\frac{31}{32}$	$1.54\frac{27}{32}$
Bell metal	33	$10.1\frac{1}{2}$	49,393	$3.02\frac{13}{16}$	$7.14\frac{1}{2}$	2.3	$1,411\frac{8}{35}$	$1.81\frac{27}{32}$	$1.20\frac{31}{32}$
Total		68.3	422,207	$20.45\frac{10}{16}$	42.8	25.11		9.77½	$10.68\frac{4}{32}

RECAPITULATION.

Kind of Bearing.	No. of bearings taken out.	Total weight of bearings put in, lbs.	Total miles run.	Total worth of bearings when put in.	Total weight of bearings when taken out.	Total weight lost.	Average number of miles run per ounce worn out.	Total worth of bearings when taken out.	Cost of running.	Cost per 1000 miles, cents.	Per cent saved by using lead lined.
Babbitt	7	68.5	187,592	$16.32\frac{3}{4}$	43.5	25.00	468.98	$9.89\frac{23}{32}$	$6.43	$3\frac{80224}{187592}$	27
Lead lined	7	68.3	422,207	$20.45\frac{5}{8}$	42.8	25.5	1,027.25	$9.77\frac{1}{2}$	$10.68\frac{1}{8}	$2\frac{223711}{442207}$	



The Victor" Track Drill.

THE cuts represe. t a sectional and perspective view of this device for drilling holes for fish-plates. It is adapted to any height or size of rail, is fastened to the top, and can be instantly removed by knocking out the key. The drill is of $\frac{5}{8}$ steel, needs no fitting, and slides from the socket when the machine is drawn back, rendering it a perfectly safe top-fastener. Its weight is only 23 lbs.; it is easily handled, drills rapidly, and can be thrown about without injury. Broken rails can be drilled in the track and fish-plates put on without drawing a spike. Invented and patented by J. H. Lakey, Chicago, Ill. C. Lakey, 6 Park Place, New-York, is the general agent.

A FRUIT-CAR is being constructed at San Francisco for the transportation of fruit from that city to Chicago. It is provided with a fan-blower driven by one of the car-axles, by means of which the air is driven through ice, which reduces it to a low temperature and then distributes it among the fruit boxes though a large perforated pipe laid along the bottom of the car. After the cool air has passed among the fruit, it returns to the blower, and is again forced through the apparatus. By this means the atmosphere of the car is kept at the uniform temperature of 40 degrees Fahrenheit. If the experiment succeeds, extensive shipments of grapes and fruits will be made to Chicago and other cities.

Gline's Rubber Roofing.

THIS style of roofing is adapted to all kinds of buildings, and particularly to railway structures on account of its durability and fire-proof qualities. It is applied in layers, will not split or crack, requires no tar or gravel, is pliable in cold weather, is clean to handle, has no smell in hot weather, can be repainted or repaired at trifling expense, and sheds water perfectly. It costs only $4\frac{1}{4}$ cents per square foot. Old roofs can be overlaid with it, and leaks effectually stopped. Full directions for its use will be given on application, at the offices of the New-York Slate Roofing Co., 8 Cedar St., New-York, and 49 South Front St., Philadelphia. See advertisement, page vi.

MR. WILLIAM WILMINGTON, of Toledo, Ohio, has invented an improvement in casting chilled car wheels. It consists in constructing the metallic annular chill with annular air chambers at the points of the interior surface of the chill where the outer periphery of the flange of the wheel is formed, and also at the points where the outer horizontal surface of the tread is formed, by means of which the central portion of the tread which receives the greatest wear is allowed to harden: but the outer periphery of the flange and the outer surface of the tread are prevented from rapid cooling by the new conducting air chamber, and the metal at these points is moulded and preserved in its full strength and tenacity, a result to be greatly desired in view of the fact that, while the process of chilling hardens the iron, it greatly impairs its tenacity and strength.

THE Ranlett Manufacturing Company, of Laconia, N. H., is making 25 to 30 car wheels per day. The shops are repairing some cars for the Boston and Lowell, building some snow-gougers for the Troy and Greenfield road, and some flat cars for contractor B. N. Farren, on that line. They will shortly begin work on a large Canadian contract.

INDEX TO VOLUME VI.

MISCELLANEOUS

A Model Passenger Coach..... 22
A New Atmospheric Brake..... 33
A New Passenger Depot in Boston..... 36
A New Director's Coach..... 111
A Pennsylvania Sunday Law Decision..... 18
A Common Sense View of the Case..... 65
A Railroad in the Balearic Islands..... 69
A Railroad 300 feet above a City..... 122
A Model Railroad Report..... 146
A Lesson for Brakemen..... 155
A New Invention relating to Steam Engines..... 166
A New Special Coach for the Erie Railway..... 166
American Locomotives in Russia..... 178
American *vs.* English Railway Practice..... 68
American Yellow and Pitch Pine..... 18
American Railroad Cars in Canada..... 20
An Early Opinion of Railroads..... 4
An Injunction against Car Manufacturers..... 52
An Important Power-Brake Suit..... 53
An Elegant Postal Car..... 122
Atlantic and Great Western Passenger Coaches..... 37
Automatic Signal and Gate System..... 67
Automatic Distance Indicator..... 23
Belts, Machine..... 33
Belting, Metal..... 66
Blast Lamp and Paint Burner..... 38
Boiler Explosions, Mysterious..... 130
California Redwoods..... 7
Car-Builders' Monthly Meeting..... 10, 25, 57, 170, 184
Carelessness in the Use of Machinery..... 129
Carelessness of Employees..... 71
Car Ventilation—Winchell's Method..... 131
Centennial Excursion Cars..... 136
Cheap Passenger Trains..... 132
Cheap Transportation and Weight of Rolling-Stock..... 177
Chemical Action of Sea-Water on Boilers..... 39
Chilson's Cone Disk Car Stove..... 185
Cork as a Non-Conductor of Heat..... 35
Continental Railway Rolling-Stock..... 50
Committee Circulars of M. C. B. Association..... 43
Committees of M. C. B. Association..... 89
Common Sense Ventilation..... 169
Completion of Hell-Gate Excavation..... 169
Combustion of Coal in Locomotives..... 180
Continuous Train Brakes..... 178
Cost and Waste of Steam Power..... 66
Defects in the Construction of Cars..... 70
Economical Consumption of Fuel..... 23
Early Use of Iron and Steel..... 179
Economy in Machine Shops..... 182
Electric Whistles for Locomotives..... 73
English and American Railways..... 149
English Railway Carriages..... 162
Extraordinary Welding..... 42
Fairbanks' Scales..... 11
Fast Freight Lines..... 19
Fancy Woods..... 35
Facts for Law-Makers to Ponder..... 50
Freight Car Mileage..... 133
Glass Rendered Tough and Unbrittle..... 86
Gline's Roofing..... 185
Hannibal and St. Joseph Railroad..... 74
Headwork the Aid to Handwork..... 166
Henderson Hydraulic Brake, Trial of..... 37
High Speed on Railways..... 4
High Grades in Switzerland..... 138
How to Burn Western Coal..... 19
Illinois Midland Passenger Coaches..... 50
Improved Railway Axle-Brakes..... 41
Improved Freight Car Construction..... 53
Improvement in the Block System..... 55
Important Discovery..... 53
Interchange of Cars..... 182
Iron and Steel Rails..... 52, 148
Iron Columns, Solid and Hollow..... 69
Iron Pipes, Lined..... 70
Journal-Bearings, Wear of..... 185
Locomotive Snow-Broom..... 11
Locomotive Improvements..... 70
Locomotives, Training Men for Running..... 151
Loughridge Brake, Trial of..... 27
Lubricants, The Requisite Qualities of..... 65
Machine Belts..... 33
Mann's Sleeping Coaches..... 122
Master Car-Builders' 9th Annual Convention..... 97, 113
Master Car-Painters' Association..... 147
Metal Belting..... 66
Mechanical Genius..... 119
Mileage of Freight Cars..... 133
More New Palace Cars..... 85
New-York Elevated Railroad..... 34, 26
New Drawing-room Coaches..... 91
Nashua Cast Steel Tires..... 123
Nuts, New Method of Making..... 130
Old Mrs. Quince and the Railroads..... 151
One of the Early Railroads..... 86
Palace Hotel Cars..... 184
Paint for Iron Surfaces..... 18
Painting of Wrought-Iron..... 129
Perfecting an Invention..... 2
Pennsylvania Railroad Regulations..... 4
Postal Car, An Elegant..... 122
Poor's Railroad Manual..... 138
Pullman Palace Cars..... 1
Purification of Water by Contact with Iron..... 26
Purchasing Agents' Convention..... 179
Proposed Railroad Club in New-York..... 37
Railway Car-Painting..... 162
Railway-Sleepers Abroad..... 162
Railroad Purchasing Agents' Association..... 179
Railroad Master Mechanics' Convention..... 81
Recent Patents..... 74
Semi-Centennial of Steam in England..... 166
So-Called Practical Men..... 129
Sound Castings..... 138
Springs for Propelling Street Cars..... 4
Speed of Trains and Weight of Rolling-Stock..... 55
Steel Rails in France..... 37
Steel Ralls, The Wearing Power of..... 151
Steel Rails on Pennsylvania Railroad..... 130
Steel Rails, Cutting them Cold..... 53
Steel and Iron Rails..... 39, 170
Steel Railway Axles..... 121
Steel and Iron Car Axles..... 145
Steam Hill Climber..... 67
Standard Sizes of Steam, Water and Gas Pipes..... 54
Stone's Double Automatic Coupler..... 169
Successive Contrasts in Color..... 20
The Law of the Rail..... 180
The Bessemer Steamship..... 1
The Cost of Transporting Freight..... 2
The Union Pacific Railroad..... 4, 179
The English Engine-Driver..... 17
The Decline in Mechanical Skill..... 19
The Cliff Elliptic Car-Spring..... 20
The Common Hammer..... 23
The Western Union Telegraph Building..... 39
The Figure and Color of Wood..... 49
The Hudson River Tunnel..... 69
The Fisher Refrigerator..... 138
The Painesville and Youngstown Railroad..... 167
The Valve Regulator as a Brake..... 163
Things to Look Into..... 170
Thorough Workmen..... 71
Trial of Continuous Brakes in England,..... 118
Union Pacific Railroad Shops..... 130
Union Pacific Railroad..... 179
What Invention has Done..... 50
Wearing Powers of Steel Rails..... 151
Wooden Rails..... 133
Wood Figure..... 162
Wonderful Engineering..... 165

ILLUSTRATIONS.

A Continuous Draw-Bar..... 182
A New Railroad Safety-Switch..... 131
An Improved Freight Car Lock..... 71
An Elliptic Spring for Street Cars..... 55
Boyden's Automatic Piston-Packing..... 19
Elliptic Spring..... 9
Eaton's Cheap Transportation Freight Car..... 21
Floor Framing of Freight Cars..... 87
Gear-Cutting Attachment for Lathes..... 67
Griffith's Continuous Draw-Bar..... 123
Hudson's Locomotive Bell-Ringer..... 2
Hopkins' Lead-Lined Journal-Bearings..... 171
Houston and Texas Central Shops..... 66
Houlton's Lubricating Axle-Box..... 86
Improved Application of Truss-Rods..... 23
Improved Bolt-Cutting Machine..... 35
Improved Railway Axle-Box..... 51
Improved Ticket-Punch..... 91
Improved Piston, Pump and Valve-Rod Gland..... 133
Narrow Gauge Passenger Car..... 119
Narrow Gauge Passenger Cars..... 165
Passenger-Car Roof Construction..... 150
Reed's Self Car-Coupler..... 34
Raddin's Elastic Rail Chair..... 53
Stone's Double Automatic Coupler..... 5
The First English Passenger Locomotive..... 178
The Ventilation of Passenger Cars..... 7
The National Freight Car Coupler..... 53
The Side Framing of Freight Cars..... 69
The Ventilation of Houses and Rooms..... 74
The End-Play of Car-Journals..... 135
The Henderson Hydraulic Brake..... 132
The Cliff Elliptic Spring..... 139
The Eccleston Ball-Coupler..... 151
The Street Car Manufactory of John Stephenson & Co..... 163
Thayer's Improved Freight Car Roof..... 39
Victor Track Drill..... 185
Wythe's Self-Regulating Speed-Gauge..... 3
Wellman's Improved Car Seat..... 37

EDITORIALS.

A Hopeful Sign..... 8
A Glance at the Situation..... 40
A New Economy..... 57
A Hint or Two about Advertising..... 73
An Encyclopedia of Car-Couplers..... 57
Annual Conventions..... 73
Broad-Tread Wheels and Mixed Gauges..... 24
Central Railroad of New-Jersey..... 57
Car Ventilation Once More..... 89
Committee on Hot Journals—A Correction..... 153
Car Painting..... 168
Elliptic Springs—Comparative Tests..... 9
Economy in Car Decoration..... 40
English and American Railway Coaches..... 137
Genuine *vs.* Counterfeit..... 8
Heating and Ventilation..... 72
Light Cars and Cheap Transportation..... 183
Master Mechanics' Eighth Annual Report..... 183
Master Car-Painters' Association..... 121
Narrow Gauge..... 56
Notice to Subscribers..... 88
Patented Car Improvements..... 120
Rail Joints..... 73
Railroad Reports and Statistics..... 56
Rapid Transit..... 8, 137
Recent English Experiments with Brakes..... 152
Scrap Castings..... 89
Settlements for Cars Destroyed..... 137
The Ninth Annual Convention..... 24
The Freight Competition..... 41
The Size and Framing of Cars..... 41
The "Catechism of the Locomotive"..... 41
The Master Mechanics' Association..... 72
The Axle Question Once More..... 73
The Master Car-Builders..... 88
The Master Mechanics' Convention..... 88
The Master Car-Builders' Convention..... 110
The Car Wheel Problem..... 120
The Keely Motor..... 121
The Outlook for Railway Manufactures..... 136
The Approaching Centennial..... 152
The Lightning Postal Trains..... 153
The Cliff Elliptic Spring..... 153
The Lehigh Valley..... 153
The New Fast Mail Postal Cars..... 154
The Car-Builders' Association Rooms..... 169
The Warming of Passenger Cars..... 168
Vose, Dinsmore & Co..... 89
Winter on the Rail..... 57
What is a Dollar?..... 136

CONTRIBUTIONS.

A Few Suggestions for the Convention..... 90
About Journal-Bearings..... 22
Car Trussing and Dead Weight..... 36
Economy *vs.* Extravagance in Railroad Management..... 38
Economy in Car Ornamentation..... 58
End-Play of Journals..... 90, 135, 181
Iron and Steel Railway Axles..... 134
Malleable Castings and Dead Weight..... 9
Passenger-Car Roof Construction..... 150
Steel and Iron Car Wheels..... 26, 89, 164
The Lubrication of Railway Rolling-Stock..... 6
The Dimensions of Freight Cars..... 6
The Present State of Railroads—Is it what it should be?..... 54
The Recent Car-Builders' Convention..... 149
Texas, its Railroads, Products, etc..... 164
The True Mission of Railroads in this Country..... 181
Wheel and Rail Surfaces in Contact..... 70

NEW PUBLICATIONS.

Narrow Gauge Railroads in America..... 58
Official Time Tables..... 139
Roper's Hand-Book of Land and Marine Engines..... 139
St. Louis Railway Register..... 27
The Railway World..... 27
The Lumber Trade..... 27
The South..... 27
The Traveler's Official Guide..... 59
The Penn Monthly..... 59
The Progressive World..... 59
The Cabinet Maker..... 154

PUBLISHERS' NOTICES.

Anti-Incrustation Boiler Fluid..... 171
Chilson's Cone-Disk Car Stove..... 185
Gline's Roofing..... 185
Locomotive Track Broom..... 155
Noyes' Liquid Packing..... 171
Purdie's Safety-Washer..... 43
Vulcanized Fibre..... 171

CAR-SHOP NOTES.

Baltimore and Ohio, at Wheeling, W. Va..... 58
Barney & Smith Manufacturing Co..... 68
Missouri, Kansas and Texas, at Sedalia..... 58
Pennsylvania Railroad, Meadow Shops..... 68

Facetiæ..... 27, 43, 59, 75, 91, 123, 139, 155, 171

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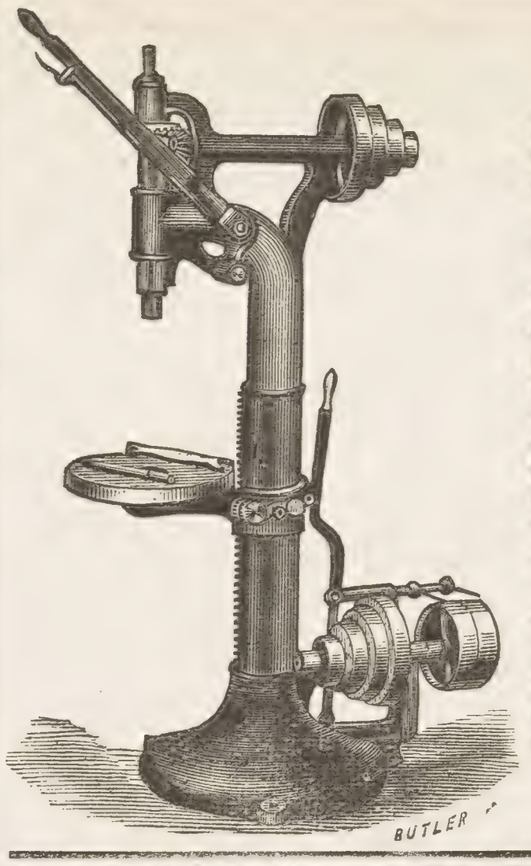
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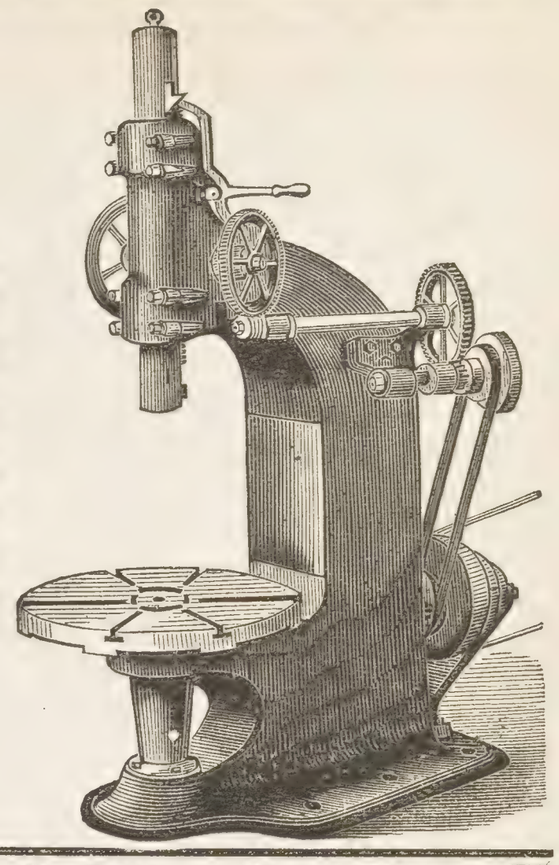


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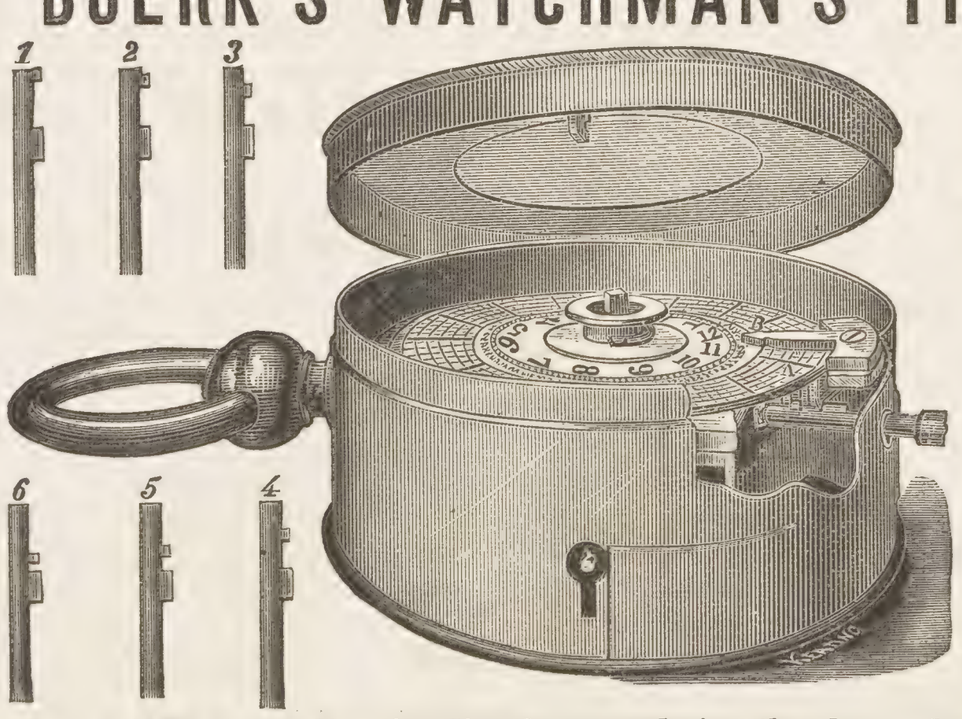
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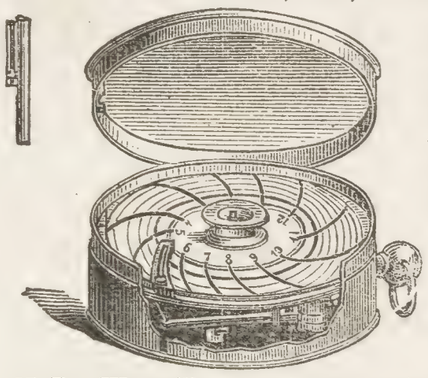
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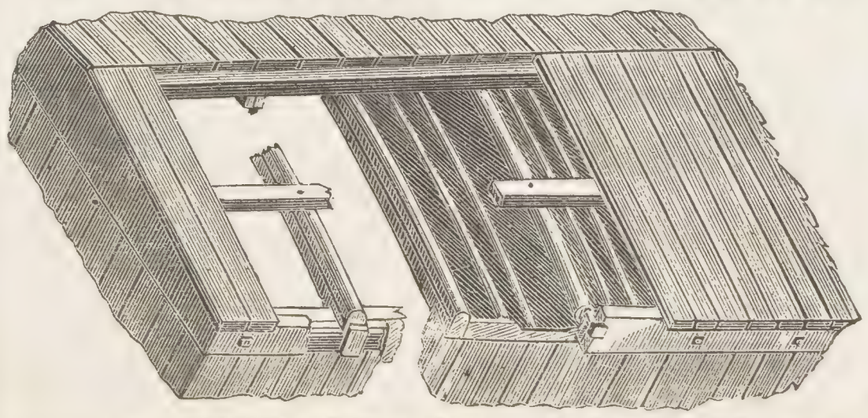
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Atlantic & Great Western	‖J. B. Miller		Shenango, Pa.
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Atlantic & Pacific & Missouri Pacific	‖R. D. Grant		St. Louis, Mo.
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Central of New-Jersey	*T. W. Peeples	George Hackett	Elizabethport, N. J.
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Central Branch Union Pacific	Geo. C. Benedict		Atchison, Kansas.
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Central R. R. of Iowa	F. B. Woodruff.		Eldora, Iowa.
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Visalia Division	S. Johnson		Lathrop, Cal.
Sacramento Division	M. W. Cooley		Rocklin, Cal.
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Burlington Division	John Bassler		Burlington, Iowa.
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Chicago, Dubuque & Minnesota	P. R. Sutton		Dubuque, Iowa.
Chicago, Rock Island & Pacific	T. B. Twombly	B. K. Verbryck	Chicago, Ill
Chicago & Michigan Lake Shore	T. J. Hartswell		St. Joseph, Mich.
Chicago, Danville & Vincennes	A. H. De Clerq		Danville, Ill.
Chicago, Milwaukee & St. Paul	J. M. Lowry		Milwaukee, Wis.
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Northern Div.		John Bailie	Milwaukee, Wis.
Iowa & Minn. Div.	J. Pettee	J. Pettee	Minneapolis, Minn.
Hastings & Dakota Division	C. C. Clements		Hastings, Minn.
Chicago & Iowa	H. S. Bryan		Aurora, Ill.
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Cincinnati, Hamilton & Dayton	James Eckford	W. H. H. Allison	Cincinnati, Ohio.
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Cincinnati & Muskingum Valley	Leroy Kells	Daniel Jewell	Lancaster, Ohio.
Cincinnati, Sandusky & Cleveland	J. R. Ames.	J. R. Ames.	Sandusky, Ohio.
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Indianapolis Division.		R. Attridge	Indianapolis, Ind.
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Cleveland & Pittsburg	N. E. Chapman	A. Steinbrunner	Cleveland, Ohio.
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Cleveland, Tuscarawas Val. & Wheeling		W. F. Turreff	Cleveland, O.
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Concord & Portsmouth	C. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Claremont	J. N. Lander	A. Langmaid	Concord, N. H.
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Connecticut Western	N. Slingland		Hartford, Ct.
Contoocook River			Concord, N. H.
Conn. & Passumpsic Rivers	Geo. Kilby		Lyndonville, Vt.
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Cumberland & Pennsylvania	J. F. Van Horne	Nathan Binnix	Mt. Savage, Md.
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Davenport & St. Paul	James Russell		Davenport, Iowa.
Dayton & Union	H. S. Gordon	J. F. Feicht	Dayton, Ohio.
Dayton & Michigan	John Black	W. H. H. Allison	Cincinnati, Ohio.
Delaware, Lackawanna & Western	Walter Dawson	Robert McKenna	Scranton, Pa.
Morris & Essex Division	W. H. Lewis	L. S. Barber	Hoboken, N. J.
Denver & Rio Grande	John Greenwood		Denver, Col.
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Detroit & Milwaukee	C. M. Hanson		Detroit, Mich.
Detroit, Lansing & Lake Michigan	Tho. E. Roberts		Ionia, Mich.
Delaware & Hudson Canal Co.	‖‖R. C. Blackall		Albany, N. Y.
Dorchester & Delaware			Cambridge, Md.
Dubuque South-Western	James Rollo	James Rollo	Farley, Iowa.
Dutchess & Columbia	W. G. Vanbuskirk	H. A. Webster	Fishkill, N. Y.
Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett	Dunkirk, N. Y.
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Eastern	John Thompson		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L. Weaver	Riverton, Ky.
East-Tennesee, Virginia & Georgia	C. A. Hodge		Knoxville, Tenn.
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Erie Railway	Robert Wallace		Susquehanna, Pa.
Erie Railway	V. Blackburn		Jersey City, N. J.
Erie Railway	F. M. Wilder	M. Wilder	Buffalo, N. Y.
Erie Railway	J. W. Chapman	J. W. Chapman	Hornellsville, N. Y
Erie Railway		‖D. B. Goodell	Elmira, NY.
Erie Railway		‖J. B. Hill	Jersey City N. J.
Erie Railway	J. Van Vechten	‖J. Van Vechten	Port Jervis, N. Y.
Erie Railway	A. T. Back		Rochester, N. Y.
Erie & Pittsburg	G. J. Parkin.	G. J. Parkin	Erie, Pa
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Evansville, Terre Haute & Chicago	§§Beriah Warren		Terre Haute, Ind.
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Fitchburg & Worcester	John Webster	Samuel Stevens	Fitchburg, Mass.
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Gilman, Clinton & Springfield	W. B. McKenna		Clinton, Ill.
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Grand Trunk.	†Herbert Wallis	Wm. McWood	Montreal, Canada.
Grand Trunk.			Sherbrooke, Can.
Grand Trunk.		B. J. Mitchell	Portland, Me.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne, Ind.
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Greenville & Columbia	R. H. Anderson	R. H. Anderson	Helena, S. C.
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Housatonic	C. R. Morris.	J. J. Ferris	Falls Village, Ct.
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Huntington & Broad-Top Mountain	W. W. Coller	M. Tellerhoof	Saxton, Pa.
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South Division	David Oxley		Centralia, Ill.
North Division	J. B. Edams		Amboy, Ill.
Iowa Division	Thomas W. Place		Waterloo, Iowa.
Illinois Midland	J. G. Clifford	G. Clifford	Paris, Ill.
Illinois & St. Louis.	James Hazen		Bellville, Ill.
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Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Indianapolis & St. Louis	A. J. Sanborn		Mattoon, Ill.
Indianapolis, Bloomington & Western	**H. L. Cooper	A. J. Allen	Urbana, Ill.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ind.
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Iron	Perry Scott	Clem. Roetling	Ironton, Ohio.
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Jeffersonville, Madison & Indiana	Reuben Wells.		Jeffersonville, Ind.
Junction & Breakwater	J. A. Maguire.		Lewes, Del.
K			
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Kansas Pacific	**L. H. Waugh	T. B. Roberts	Wyandotte, Kansas.
Denver Pacific Div	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div.	**L. H. Waugh		Wyandotte, Kansas.
Junction City & Ft. Kearney Div	**L. H. Waugh		Wyandotte, Kansas.
Arkansas Valley Div	**L. H. Waugh		Wyandotte, Kansas.
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Knoxville & Charleston			Knoxville, Tenn.
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Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland, Ohio.
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Buffalo Division	W. L. Wallace	A. C. Robson	Buffalo, N. Y.
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Lehigh Valley	P. Hofecker		Weatherly, Pa.
Lehigh Valley	John Campbell		Delano, Pa.
Lehigh Valley	D. Clark		Hazleton, Pa.
Leavenworth, Lawrence & Gal	J. S. McCrum		Ottawa, Kansas.
Little Rock & Fort Smith	James Eblin	D. R. Wing	Argenta, Ark.
London & Port Stanley			London, C. W.
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Louisville & Nashville	†Thatcher Perkins	Isaac M. Owens	Louisville, Ky.
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Clarksville Division	Jas. Montgomery		Bowling Green, Ky.
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South & North Ala. Div.	C. E. Slade	W. L. Gude	Birmingham, Ala.
Memphis & Ohio Div.	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Louisville, Paducah & So. Western	W. D. Robb	Frank Looney	Elizabethtown, Ky
M			
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Macon & Brunswick	R. Wagnon	R. Wagnon	Macon, Ga.
Macon & Western	D. M. Gogel	James A. Knight	Macon, Ga.
Maine Central	J. W. Philbrick	J. W. Philbrick	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div	John Ellis	C. H. Kenison	Augusta, Me.
Maine Central Division	John F. Merrill		Waterville Me.
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Marietta & Cincinnati	E. M. Bosley	E. M. Bosley	Chillicothe, Ohio.
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Maryland & Delaware	Samuel Peters		Greensboro, Md.
Memphis & Little Rock	Tho. Rennell	P. Twitchell	Argenta, Ark.
Memphis & Charleston	H. A. Burford	A W. Drew	Memphis, Tenn.
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Michigan Central	§§Geo. S. Chalender	Geo. S. Chalender	Jackson, Mich.
Michigan Central		‖Henry Whiting	Detroit, Mich.
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Mineral Range	Geo. F. Coon		Hancock, Mich.
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Missouri, Kansas & Texas	C. T. McElvaney		Sedalia, Mo.
Missouri, Kansas & Texas	Wm. T. Small		Parsons, Kan.
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Missouri River, Fort Scott & Gulf	John S. McCrum	Alex. Montier	Kansas City, Mo.
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Mobile & Girard	C. D. Wall		Girard, Ala.
Mobile & Ohio		John McHugh	Mobile, Ala.
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Mobile & Ohio	B. S. Herring		Macon, Miss.
Mobile & Ohio	R. H. Briggs		Jackson, Tenn.
Montgomery & Eufaula	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Algiers, La.
Montreal Northern Colonization	§§C. G. C. Simpson		Montreal, Can.
N			
Nashville & Chattanooga	John U. Eastman	J. G. Sawyer	Nashville, Tenn.
Naugatuck	Henry Hanford	George W. Gray	Bridgeport, Ct.
New-Bedford	G W. Reynolds	John L. Gibbs	New-Bedford, Mass.
New-Brunswick	P. Logan	C. M. Kinnon	Fredericton, N. B.
New-Brunswick & Canada	Tho. Armstrong	G. Houlton	St. Andrew's, N. B
New-Haven & Northampton	Henry Fox	Henry Fox	New-Haven, Ct.
New-Jersey Midland	Duane Searle		Wortendyke, N.J.
New-Jersey & New-York	A. J. Auryansen		Jersey City, N. J.
New-Jersey Southern	Rufus Blodgett		Manchester, N. J.
New-Orleans, St. Louis & Chicago	‡‡——. Allen		McComb City, Miss.
New-Orleans, St. Louis & Chicago	§§L. H. Sellars		Water Valley, Miss.
New-Orleans, St. Louis & Chicago		G. H. White	McComb City, Miss.
New-Orleans & Mobile	§Josiah Bettis	W. J. Henderson	Mobile, Ala.
New-York, Kingston & Syracuse	A. Q. Mackenbush	G. Dikeman	Syracuse, N. Y.
New-York & Harlem	Wm. M. Strong	C. E. Garey	New-York.
New-York Central & Hudson River		††Leander Garey	New-York.
New-York Central Division	‡G. B. Van Vorst	D. Hoit	West-Albany, N. Y.
New-York Central Division	Henry Watkeys		Syracuse, N. Y.
New-York Central Division	Amos Gould	James Leary	Rochester, N. Y.
New-York Central Division	Jas. Butman	Wm. Johnson	Buffalo, N. Y.
New-York Central Division	S. L. White	George Rowe	Niagara Falls, N. Y.
Hudson River Division	‡Wm. Buchanan	E. A. Olmstead	New-York City.
Hudson River Division	R. Greenalch	J. J. Conaghty	E. Albany, N. Y.
New-York, Boston & Montreal	W. G. Van Buskirk	H. A. Webster	Dutchess Junc., N.Y.
New-York & Oswego Midland	§§W. A. Dripps		Oswego, N. Y.
Eastern Division	J. Minchell		Middletown, N. Y.
Middle Division	Tho. Howard		Norwich, N. Y.
Northern Division	Edward Van Vleck	T. D. Day	Oswego, N. Y.
New-York & New-England	Geo. E. Boyden	Elias E. Pratt	Boston, Mass.
New-York, Providence & Boston	Jas. H. Anderson	Jas. H. Anderson	Providence, R. I.
New-York, New-Haven & Hartford	§§H. Kittendorf	James Denver	New-Haven, Ct.
New-York, New-Haven & Hartford	S. E. Brewer	F. Leppens	Hartford, Ct.
Northern Central	G. W. Rhodes		Baltimore, Md.
Northern Central	James Strode	G. W. Demarest	York, Pa.
Northern New-Hampshire	James W. Lander	Albert Langmaid	Concord, N. H.
Northern of Canada	P. Clark.	P. Clark	Toronto, Can.
Northern Pacific	**H. A. Towne		Brainerd, Minn.
Minnesota Division	W. H. Lewis		Brainerd, Minn.
Dakota Division	C. W. Rossiter		Fargo, D. T.
Pacific Division	J. F. Curtis		Kalama, W. T.
North-Carolina	Rufus D. Wade	B. G. Sergeant	Co. Shops, N. C.
North-Louisiana & Texas	C. H. Tull		Monroe, La.
North-Pennsylvania	Franklin Roop	Franklin Roop	Philadelphia, Pa.
North-Eastern	D. W. Haines	A. M. Corrie	Florence, S. C.
Norwich & Worcester	Richard Colburn	G. R. Bentley	Norwich, Ct.
O			
Ohio & Mississippi		G. Hibbert	Cochran, Ind.
Ohio & Mississippi	‡J. D. W. Potts		Seymour, Ind.
Oil City & Pithole	George Thompson		Pithole, Pa.
Oil Creek & Alleghany River	H. J. Bookhammer	John Monks	Oil City, Pa.
Old Colony & Newport	J. K. Taylor	A. Gleason	Boston, Mass.
Oregon & California	§§J. Brandt.		Portland, Oregon.
Owensburg & Russellville	J. R. Osborne		Owensburg, Ky.
P			
Paducah & Memphis	J. S. Mackay		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Panama	Chas. E. Stewart		Aspinwall, N. G.
Pacific of Missouri	§§John Hewitt	J. Hodge	St. Louis, Mo.
Paris & Danville	B. L. Baldwin	B. L. Baldwin	Danville, Ill.
Pennsylvania	§§T. N. Ely		Altoona, Pa.
Pennsylvania	H. D. Garrett	I. W. Van Houten	W. Philadelphia, Pa.
Pennsylvania	E. L. Caum	Samuel W. Myers	Harrisburg, Pa.
Pennsylvania	G. W. Strattan	John P. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver	R. S. Ramsey	Pittsburg, Pa.
New-Jersey Division	L. A. Bosdevex	E. F. Bosdevex	Meadow Shops, N. J.
New-Jersey Division		David H. Baker	Jersey City, N. J.
West-Penn. Division	C. B. Street	M. H. Fales	Blairsville, Pa.
Peoria & Rock Island	Geo. Gregg		Peoria, Ill.
Peoria, Pekin & Jacksonville	R. F. Hurd	R. F. Hurd	Pekin, Ill.
Petersburg & Weldon	R. B. Andrews	Alex. Wright	Petersburg, Va.
Philadelphia, Wilmington & Baltimore	S. A. Hodgman	Wm. Lundgren	Wilmington, Del.
Philadelphia & Baltimore Central	S. D. Danfield	Samuel D. Danfield	Chester, Pa.
Philadelphia and Erie	Martin Walls		Sunbury, Pa.
	W. L Forster		Renovo, Pa.
	W. L. Holman		Kane, Pa.
	W. T. Smith		Erie, Pa.
	§§Howard Fry		Erie, Pa.
Philadelphia & Reading	L. B. Paxson	Aaron Steinbach	Reading, Pa.
Germantown & Norris'n Div	Jackson Richards		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis		‖D. F. Andregg	Dennison, Ohio.
Pittsburg & Columbus Division	Ross Kells	Thos. D. Furgusen	Steubenville, Ohio.
Little Miami Division		M. P. Ford	Columbus, Ohio
Little Miami Division	J. H. Setchel	John McVay	Cincinnati, Ohio.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlin	Columbus, Ohio.
Col., Cin. & Ind. Division	Geo. H. Prescott	Geo. H. Prescott	Logansport, Ind.
Pittsburg, Fort Wayne & Chicago	S. M. Cummings	John Marquis	Allegheny, Pa.
Pittsburg, Fort Wayne & Chicago	J. M. Boon.	Israel Lee	Fort Wayne, Ind
Pittsburg, Fort Wayne & Chicago		J. J. Kirkland	Crestline, Ohio.
Pittsburg, Virginia & Charlston	W. Lininger		Pittsburg, Pa.
Pittsburg, Washington & Baltimore	§Wm. Stearns		Connellsville, Pa.
Pittsburg, Washington & Baltimore	J. E. Sampsel	J. M. Leach	Pittsburg, Pa.
Portland & Rochester	John G. Brady	John G. Brady	Portland, Me.
Portland & Oxford Central	Geo. W. Battles	Geo. W. Battles	Buckfield, Me.
Portland, Saco & Portsmouth	John Donnell		Portland, Me.
Port Royal	Geo. Riley	J. H. Milton	Augusta, Ga.
Port Hope, Lindsay & Beaverton	H. G. Taylor	H. G. Taylor	Port Hope, Can.
Portsmouth, Gt. Falls & Monmouth	James Tucker	E. Fall	Union Village, N.H.
Poughkeepsie & Eastern	John L. Driscoll	Jerry Wigg	Poughkeepsie, N. Y.
Providence & Worcester	Joseph Kelly	Olney L. Smith	Providence, R. I.
Providence, Warren & Bristol	Rufus Smith	J. Brightman	Bristol, R. I.
Q			
Quincy, Alton & St. Louis	J. O. Gravell	W. G. Gilbert	Quincy, Ill.
Quincy, Missouri & Pacific	W. F. Smith	W. F. Smith	Kirksville, Mo.
R			
Raleigh & Augusta Air-Line	**B. R. Harding		Raleigh, N. C.
Raleigh & Gaston	**B. R. Harding	B. R. Harding	Raleigh, N. C.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Richmond, Fredericksburg & Potomac	H. Kuhn	W. H. Trainham	Richmond, Va.
Richmond, Danville & Piedmont		J. B. Vaughan	Richmond, Va.
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond, Va.
Richmond & York River	C. H. Harris	J. L. Thompson	Richmond, Va.
Rive De Loup	P. A. Logan	C. R. McKinnin	Fredericton, N. B.
Rome, Watertown & Ogdensburg	Abram Klohs	H. H. Sessions	Rome, N. Y.
Rome, Georgia	O. W. Harbin	O. W. Harbin	Rome, Ga.
Rochester & Genesee Valley	M. E. Brown	M. Wilder	Buffalo, N. Y.
Rockford, Rock Island & St. Louis	Joseph Elder	T. F. Nolte	Beardstown, Ill.
S			
Saginaw Valley & St. Louis	W. S. Thompson		Saginaw, Mich.
San Antonio & Mexican Gulf	W. T. Bingham		Victoria, Texas.
Savannah & Charleston	P. J. Hutson	J. D. Murphy	Charleston, S. C.
Seaboard & Roanoke	§§M. M. Pendleton		Portsmouth, Va.
Selma & Gulf	Wm. T. Daughtrey		Selma, Ala.
Selma, Rome & Dalton		W. W. Peirce	Selma, Ala.
Selma, Marion & Memphis	J. M. Levis.		Marion, Ala.
Sheboygan & Fond du Lac	John Hickey	John Hickey	Sheboygan, Wis
Sioux City & Pacific	C. H. Foster		Missouri Val., Iowa.
Southern Pacific of California	J. P. Wilson	F. N. Bellisle	San Francisco, Cal.
South-Carolina	W. B. Smith	John Reed	Charleston, S. C.
Southern Central	Chas. G. Brown	H. Mooney	Auburn, N. Y.
Southern, of Long Island	Mark Brear	C. Wilkinson	Brooklyn, N. Y.
Southern Minnesota	§§J. B. Henney.		Hokah, Minn.
South-Western of Georgia	C. D. Wall.		Columbus, Ga.
South-Western of Georgia	D. M. Gogel	James A. Knight	Macon, Ga.
South Side of Long Island	A. P. Doane	A. P. Doane	Williamsburg, L.
Spartanburg & Union	J. E. Francis	Jacob Rice	Union C. H., S. C.
Springfield, Athol & Northeastern	W. E. Granger		Springfield, Mass.
Stanstead, Shefford & Chambly	W. H. Smith		Waterloo, C. E.
Stockton & Ione		D. L Treat	Stockton, Cal.
Stonington & Providence	J. H. Anderson	J. H. Anderson	Providence, R. I.
St. Croix & Penobscot	Edward Bolton	A G. Page	Milltown, Me.
St. Joseph & Denver City	E. Sleppy		St. Joseph, Mo.
St. Lawrence & Ottawa	Calvin Dame	Calvin Dame	Prescott, Canada.
St. Louis, Iron Mountain & Southern	O. A. Haynes	Oscar Doolittle	Carondelet, Mo.
Arkansas Division	L. Finlay	L. Finlay	Little Rock, Ark.
St. Louis, Vandalia, T. Haute & Ind.	§§C. R. Peddie	E. D. Carter	Terre Haute, Ind.
Indianapolis Division	Wm. Riley		Terre Haute, Ind.
Vandalia Division	Chas. Butler.		Effingham, Ind.
St. Louis, Alton & Terre Haute	**Beriah Warren		St. Louis, Mo.
St. Louis, Salem & Little Rock	Thos. Everson		Steelville, Mo.
St. Louis & South-Eastern	W. H. H. Price	W. H. H. Price	Henderson, Ky.
St. Louis & South-Eastern	‖‖L. B. Salisbury		Mt. Vernon, Ill.
St. Louis & South-Eastern	‖E. M. Hamstone		Edgefield, Tenn.
St. Paul & Pacific	J. C. Monroe	T. W. Heathcote	St. Paul, Minn.
St. Paul & Sioux City	F. C. Butterfield	J. W. Lydic	Shakopee, Minn.
St. Louis, Kansas City & Northern	W. H. Selby	C. S. Buck	Moberly, Mo.
St. Louis, Keokuk & Northwestern	Chas. Humphreys		Canton, Mo.
St. Louis, Lawrence & Western	J. A. Hagan		Lawrence, Kan.
Sullivan & Erie			Tonawanda, Pa.
Syracuse, Binghamton & New-York	H. H. Dawson	David Burling	Syracuse, N. Y.
Syracuse Northern	W. Garrison	L. W. Smith	Syracuse, N..
T			
Tennessee & Pacific	William McKeand	William McKeand	Nashville, Tenn.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	J. A. Hanglin		Marshall, Texas
Tioga	Peres Bonny	D. H. Stratton	Blossburg, Pa
Toledo, Peoria & Warsaw	W. O. Hewitt	R. M. Hemphill	Peoria, Ill.
Toledo, Wabash & Western	§J. B. Morse		Fort Wayne, Ind
Toledo, Wabash & Western	‖John C. Wills		Lafayette, Ind.
Toledo, Wabash & Western	Jacob Johann		Springfield, Ill.
Toledo, Wabash & Western		U. H. Kohler	Toledo, Ohio.
Toronto, Grey & Bruce	Wm. Bowstead		Toronto, Can
Toronto & Nipissing	J. Haggus		Toronto, Canada.
Troy & Boston	Foster Church	R. V. Coon	Troy, N. Y.
U			
Union Pacific	§I. H. Congdon	‡‡Geo. E. Stevens	Omaha, Nebraska.
Eastern Division		‖A. M. Collett	Omaha, Neb.
Eastern Division		‖H. P. Makely	Grand Island, Neb.
Mountain Divison		‖Jno. E. Davis	Cheyenne, W. T.
Laramie Division		‖Floyd Heavaner	Laramie, W. T.
Western Division		‖C. A. Phipps	Evanston, U. T.
Utah Central	Thos. Pierpont	Thos. Pierpont	Salt Lake City.
Utica & Black River	John Bailey	David James	Utica, N. Y.
Utica, Chenango & Susquehanna	C. H. Brown		Utica, N. Y.
V			
Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.
Virginia & Truckee	Wm. Bowker		Carson, Nev.
W			
Wash. City, Va. Midland & Gr. Southern	Jas. E. Waddey	J. T. Nalls	Alexandria, Va.
Washington & Ohio	Edward Dunn	Joshua Harrison	Alexandria, Va
Welland	James Taylor	James Chase	St. Catharine, C. W.
Westchester & Philadelphia	John Moyer	N. Pawling	Philadelphia, Pa.
Western & Atlantic	John H. Flynn	Wm. Grambling	Atlanta, Ga.
Western Maryland	Wm. Lannan	J. H. Nussear	Union Bridge, Md.

Railroad.	Master-Mechanic.	Master Car-Builder.	Residence.
Western North-Carolina	J. D. Hollister	J. D. Hollister	Salisbury, N. C.
Western of Alabama	C. D. Wall	C. D. Wall	Montgomery, Ala.
Western R. R. N. C	M. W. Atkinson	M. W. Atkinson	Fayetteville, N. C.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
West-Feliciana	J. A. Tilton.	Wm. McKelvey	Woodville, Miss.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
West-Wisconsin	Matt Ellis	J. C. Fischer	Hudson, Wis.
White Water Valley	A. W. Britton		Harrison, Ohio.
Wilmington, Columbia & Augusta	W. H. Turrintine		Wilmington, N. C.
Wilmington & Weldon	John Bissit	C. R. Clowe	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Winona & St. Peter	F. C. Ford	F. C. Ford	Winona, Minn.
Wisconsin Central	G. Campbell	J. L. Adams	Stevens' P't, Wis.
Worcester & Nashua	John G. Brady		Worcester, Mass
Wyandotte, Kansas City & N. Western.	W. W. Brownhill		Independence, Mo.

DIRECTORY
OF
Railway Superintendents and Purchasing Agents
THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director. ‡ Ass't. Gen. Supt. § Ass't Supt.

Railroad.	Superintendent.	Purchasing Agent	Residence.
A			
Adirondack	C. H. Ballard		Saratoga. N. Y.
Alabama Central	John M. Bridges		Selma, Ala.
Albany & Susquehanna	*C. F Young		Honesdale, Pa.
Allegheny Valley	David McCargo	John L. Awl	Pittsburg, Pa.
Arkansas Central	James A. Tappan		Helena, Ark.
Atchison, Topeka & Santa Fe	C. F. Morse	C. F. Morse	Topeka, Kansas.
Atchison & Nebraska	L. W. Towne		Atchison, Kan.
Atchison & Nebraska	*Geo. H. Nettleton		Kansas City, Mo.
Alabama & Chattanooga	C. H. Stanton	T. J. Carlile	Meridan, Miss.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Ashtabula, Ohio.
Atlanta & Richmond Air Line	L. P. Grant, *Rec.*		Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	J. H. Holway	Meadville, Pa.
First Division	J. T. Odell		Meadville, Pa.
Second Division	A. L. Dunbar		Meadville, Pa.
Third and Fourth Division	T. A. Phillips		Galion, Ohio.
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage.	C. W. Rogers	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.
B			
Baltimore & Ohio	Thos. R. Sharp	Benj. Williams	Baltimore, Md.
Ohio & Chicago Divisions	W. C. Quincy		Columbus, Ohio.
Baltimore & Potomac	Geo. C. Wilkins.	A. W. Sumner.	Baltimore, Md.
Bangor & Piscataquis	M. H. Angel	L. H Eaton	Bangor, Maine.
Boston. Barre & Gardner	I. N. Ross		Worcester. Mass.
Boston & Albany	*Wm. Bliss		Boston, Mass
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & New-York Air-Line	W. H. Turner		Middletown, Ct.
Boston & Providence	A. A. Folsom	A. A. Folsom	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood	Chas. Brigham	Fitchburg, Mass.
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A Dodge	Lyon & Vose	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood	Boston, Mass.
Boston, Lowell & Nashua	W. M. Parker	F. H. Nourse	Boston, Mass.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Brunswick & Albany	C. L. Schlatter		Brunswick, Ga.
Burlington & Missouri River (in Neb.)	Wm. Irving		Omaha, Neb.
Burlington, Cedar Rapids & Minnesota	*E. F. Winslow		Cedar Rapids, Ia.
Burlington, Cedar Rapids & Minnesota		A. G Thompson	St. Louis, Mo.
Burlington & South-Western	R. T. Hosford	O. W. Owen	Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo Corry & Pittsburg	David McCargo	N. M. Whitside	Pittsburg, Pa.
C			
Cairo & St. Louis	J. L. Hinkley	C. Ritsema	St. Louis, Mo.
Cairo & Vincennes	Henry L. Morrill		Cairo, Ill.
Camden & Atlantic	F. A. Lister	J. L. Wendell	Camden, N. J.
Canada Central, Brockville, & Ottawa	H. P. Alden		Brockville, Can.
Canada Southern	*W. K. Muir		St. Thomas, Ont.
Canada Southern	Jas. Webster	E. W. Porter	St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua, Pa.
Cayuga Lake	J. L. Grant		Ithaca, N. Y.
Central Branch Union Pacific	W. F. Downs	W. F. Downs	Atchison, Kan.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Central Pacific	‡John Corning		Sacramento, Cal.
Western Division	E. C. Fellows		Lathrop, Cal.
Visalia Division	E. C. Fellows		Lathrop, Cal.
Truckee Division	Frank Free		Wadsworth, Nev.
Humboldt Division	R. S. Matteson		Carlin, Nevada.
Oregon Divison	J. A. Fillmore		Sacramento, Cal.
Sacramento Division	J. A. Fillmore		Sacramento, Cal.
Salt Lake Division	R. H. Pratt		Ogden, Utah.
California Pacific Division	A. D. Wilder		Vallejo, Cal.
Central Vermont	J. W. Hobart		St. Albans, Vt.
Western Division	John Schrier		Ogdensburg, N. Y.
Central & Southern Division	Ambrose Arnold		St. Albans, Vt.
Northern & Eastern Division	G. L. Stone	"	"
Rutland Division	J. Burdett		Rutland, Vt.
Harlem Extension Division	J. Burdett		Rutland, Vt.
New-London Northern	G. W. Bentley		New-London, Ct.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Atlanta Division	G. J. Foreacre		Alexandria, Va.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	*W. M. S. Dunn	J. A. Netherland	Richmond, Va.
Eastern & Middle Division	J. L. Morrow.		Staunton, Va.
Western Division	J. E. Mallory		
Charlotte, Columbia & Augusta	James Anderson		Columbia, S. C.
Cheshire	R. Stewart	H. H. Stone	Keene, N. H.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt	R. W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	J. B. Mulliken		Escanaba, Mich.
Madison Division	C. A. Swineford.		Baraboo, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis.
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver		Clinton, Iowa.
Western Iowa Division	John A. Head		Boone, Iowa.
Chicago & Alton	J. C. McMullin	A. V. Hartwell	Chicago. Ill.
Chicago, Burlington & Quincy	R. Harris	D. B. Sibley	Chicago, Ill.
Chicago Burlington & Quincy	‡C. H. Hudson		Chicago, Ill.
Eastern and Middle Division			Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division.	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota.	C. Harris	F. I. Massey	Dubuque, Iowa.
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	*Geo. S. Bowen.	James Penny	Chicago, Ill.
Chicago & Pacific	J. M. Whitman		Chicago, Ill.
Chicago & Paducah	W. P. Sis on		Streator, Ill.
Chicago, Rock Island & Pacific.	Hugh Riddle.	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chicago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
Chicago & Michigan Lake Shore	*Geo. C. Kimball.	Wm. R. Morrison.	St. Joseph, Mich.
Chicago, Danville & Vincennes	L. Pearson	J. L. Yale	Chicago, Ill.
Chicago, Milwaukee & St. Paul	*S. S. Merrill	J. T. Crocker	Milwaukee, Wis.
Chicago, Pekin & Southwestern	W. P. Sisson		Streator, Ill.
Chicago & Canada Southern	D. Edwards		Toledo, Ohio.
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.
Cincinnati, Richmond & Chicago	Lewis Williams		Cincinnati, Ohio
Cincinnati & Martinsville	T. C. Burnside.		Franklin, Ind.
Cin., Cumberland Gap & Charleston	W. J. Taylor		Knoxville, Tenn.
Cincinnati Hamilton & Dayton	Lewis Williams.	P. Hickey	Cincinnati, Ohio.
Cincinnati, Hamilton & Indianapolis	Lewis Williams		Cincinnati, Ohio.
Cincinnati, Lafayette & Chicago	Jas. H. Stewart.	G. G. Hadley	Lafayette, Ind.
Cincinnati, Sandusky & Cleveland	*D. W. C. Brown		Sandusky, Ohio.
Cincinnati, Sandusky & Cleveland	Chas. Howard		Springfield, Ohio.
Cleveland, Columbus, Cincinnati & Ind.	E. S Flint		Cleveland, Ohio.
Indianapolis Division	C. C. Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division.	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough.	Wm. Mullins	Pittsburg, Pa.
Cleveland, Mt. Vernon & Delaware.	G. A. Jones		Mt. Vernon, Ohio.
Cleveland, Tuscarawas Val. & Wheeling	*E. B. Thomas	W. W. Card, *Supt*	Cleveland, Ohio.
Colorado Central	R. E. Carr		Golden, Col.
Columbus & Hocking Valley	M. M Green.		Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H. E. Chamberlin.	H. E. Chamberlin.	Concord, N. H.
Connecticut River	John Mulligan	John Mulligan.	Springfield, Mass.
Connecticut & Passumpsic Rivers	H. E. Folsom	Geo. Killey	Lyndonville, Vt
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Corning, Cowanesque & Antrim	A. H. Gorton	R. J. Burnham	Corning, N. Y.
Cumberland Valley	J. F. Boyd	J. F. Boyd	Chambersburg, Pa.
Cumberland & Pennsylvania	J. A. Millholland		Mt. Savage, Md.
D			
Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	J. R. Meckling	J. R. Meckling	Sioux City, Iowa.
Davenport & St. Paul	*John E. Henry		Davenport, Iowa.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware & Hudson Canal Co.	*C. F. Young		Honesdale, Pa.
Albany & Susq. Division	C. D. Hammond		Oneonta, N. Y.
Rensselaer & Saratoga Div.	Theo. Voorhees		Troy, N. Y.
Delaware, Lackawanna & Western		G. W. B. Cushing	New-York City.
Delaware, Lackawanna & Western	W. F. Hallstead		Scranton, Pa.
Lack. & Bloomsburg Div.	D. T. Bound		Kingston, Pa.
Morris & Essex Division	Andrew Reasmer		Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus. Division	W. F. Hallstead		Utica, N. Y.
Denver & Rio Grande	W. W. Borst	W. S. Jackson	Denver, Col.
Detroit and Milwaukee	S. R. Callaway	John S. Lorimer	Detroit, Mich.
Detroit, Hillsdale & Southwestern	W. F Parker.		Ypsilanti, Mich.
Detroit, Eel River & Illinois	T. B. Sargeant		Logansport, Ind.
Detroit, Lansing & Lake Michigan	J. B. Mulliken	C. D. Childs	Detroit, Mich
Dorchester & Delaware	J. M. Murphy		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer.	C. V DeForest	Fredonia, N. Y.
Dubuque & South-Western	J. P. Farley		Dubuque, Iowa
Dutchess & Columbia	C. L. Kimball		Dutchess J'n, N. Y.
E			
East Alabama & Cincinnati	R. H. Kelly		Opelika, Ala.
East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern	Geo. Bachelder	C. W. Pratt	Boston, Mass.
Erie & Pittsburg	J. M. Kimball		Erie, Pa.
Erie Railway,	E. S. Bowen	C. H. Bowman	New-York City.
Erie	P. P. Wright		Jersey City, N. J.
Eastern Division	E. O. Hill		Port Jervis, N. Y.
Delaware Division	Benj. Thomas		Port Jervis, N. Y.
Rochester Division	M. E. Brown		Rochester, N. Y.
Susquehanna Div.	C. W. Gardner		Elmira, N. Y.
Buffalo Division	R. G. Taylor		Buffalo, N. Y.
Western Division	J. S. Beggs		Buffalo, N. Y.
Erie & Pittsburg	*J. D. Layng	Wm. Mullins	Pittsburg, Pa.
European & North-American	F. W. Cram		Bangor, Maine.
Evansville & Crawfordsville	John E. Martin		Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.
F			
Fitchburg	Chas. L. Heywood.	John Adams	Boston, Mass.
Vermont & Mass. Div.	C. H. Comee.		Fitchburg, Mass.
Flint & Pere Marquette	Sanford Keeler		East-Saginaw, Mich.
Flushing & North-Side	I. D. Barton		Hunter's Point, L. I.
Flushing & North-Side		A. E. Godeffroy	New-York City.
Fort Wayne, Jackson & Saginaw	D. W. Smith		Jackson, Mich.
Fort Wayne, Muncie & Cincinnati	W. W. Worthington		Fort Wayne, Ind.
G			
Galveston, Harrisburg & San Antonio	Hardy Eddins.	J. W. Pierce.	Galveston, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Geneva, Ithaca & Athens	R. A. Packer		Ithaca, N Y.
Georgia	S. K. Johnson	John Vaughn	Augusta, Ga.
Gilman, Clinton & Springfield	T. J. Hudson		Springfield, Ill.
Grand Gulf & Port Gibson	G W. McGinnis		Port Gibson, Miss,
Grand Rapids & Indiana	Wm. O. Hughart		Grand Rapids, Mich.
S. Division	J. M. Matheany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich.
Grand Rapids & Indiana	*W. O. Hughart		Grand Rapids, Mich.
Grand Trunk	*J. Hickson	John Taylor	Montreal, Canada.
East Division	Henry Bailey		Montreal, Canada.
West Division	W. J. Spicer		Toronto, Canada.
Grand Tower and Carbondale	T. M. Williamson.	Wm. W. Harris.	Grand Tower, Ill.
Great Southern of Ga. & Fla	M. H. Alberger		Jacksonville, Fla.
Great Western (Canada)	Andrew Watson.	Robert Beatty	Hamilton, Ont.
Green Bay & Minnesota	S. B. Kenrick		Green Bay, Wis.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.
H			
Hannibal & St. Joseph	*R. S. Stevens	W. J. Hilton	Hannibal, Mo.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin	D. S. Draper	Bridgeport, Ct
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	C. A. Burton		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top.	Geo. F. Gage	B. A. Knight	Huntingdon, Pa.
I			
Illinois Central	Jos. F. Tucker		Chicago, Ill.
Illinois Central.	*Jas. C. Clarke	O. Ott	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois Midland	R. G. Hervey	‡P. Campbell	Terre Haute, Ind.
Illinois & St. Louis	W. K. McComas		St. Louis, Mo.
Indianapolis, Bloomington & Western	C. C. Smith		Indianapolis, Ind.
Indianapolis, Bloomington & Western	Geo. B. Wright, Receiver		Indianapolis, Ind.
Indianapolis, Cincinnati & Lafayette	Geo. L. Barringer	E. V. Cherry	Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna		Indianapolis, Ind.
Indianapolis & Vincennes		Wm. Mullins.	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward	J. W. Morse.	St. Louis, Mo.
Indianapolis, Peru & Chicago	E. C. Murphy	D. Macy.	Indianapolis, Ind.
Michigan City Division			La Porte, Ind.
Intercolonial Railway	Lewis Carvell	Sam. Watson	Moncton, N. B.
International & Great Northern	H. M. Hoxie		Palestine, Texas.
J			
Jacksonville, North-Western & S. E.	E. S. Greenleaf		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	Robert Walker		Jacksonville, Fla
Jeffersonville, Madison & Indianapolis		Wm. Mullins	Pittsburg, Pa.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
Jeffersonville, Madison & Indianapolis	*D. W. Caldwell		Columbus, Ohio.
Jefferson, Madison & Indianapolis,	Horace Scott		Louisville, Ky.
Junction & Breakwater	Tho. Groom		Lewes, Del.
K			
Kansas Central	W. R. Martin		Leavenworth, Kan.
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard	J. F. Barnard	St. Joseph, Mo.
Kansas City, St. Joseph & Council Bluffs	*Geo. H. Nettleton		Kansas City, Mo.
Kansas Midland	W. W. Fagan		Topeka, Kan.
Kansas Pacific	O. S. Lyford		Kansas City, Mo.
Kansas Pacific	O. S. Lyford	J. L. Woods	St. Louis, Mo.
Kaw Valley Division	O. H. Dorrance		Lawrence, Kan.
Smoky Hill Division	J. Loomis		Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col
Kentucky Central	G. H. Pendleton	Geo. P. Bowler	Covington, Ky.
Keokuk & Des Moines Valley	Geo. H. Griggs		Keokuk, Iowa.
Knox & Lincoln	C. A. Coombs	Oliver Morse	Bath, Maine.
L			
Lackawanna & Bloomsburg	D. T. Bound		Kingston, Pa.
Lake Erie & Louisville	I. H. Burgoon		Fremont, Ohio.
Lake Ontario Shore	E. A. Van Horne		Oswego, N. Y.
Lake Superior & Mississippi	G. H. Smith	C. F. Cruft	St. Paul, Minn.
Lake Shore & Michigan Southern	Charles Paine	A. C. Armstrong	Cleveland, Ohio.
Kalamazoo Division	William Wheaton		Kalamazoo, Mich.
Leavenworth, Lawrence & Galveston	B. S. Henning		Lawrence, Kan.
Leavenworth, Lawrence & Galveston	*Geo. H. Nettleton		Kansas City, Mo.
Lawrence & South-Western	R. B. Gemmell	R. B. Gemmell	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
Lehigh Valley		L. Chamberlin	Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa.
Mahony Division	James I. Blakslee		Mauch Chunk, Pa.
New-Jersey Division	H. E. Packer		Metuchen, N. J.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	T. Hartman		Little Rock, Ark.
Logansport, Crawfordsville & S. W.			Terre Haute, Ind.
Long Island	G. W. N. Custis		Hunter's Point, L. I.
Louisville & Nashville & G. Southern	D. W. C. Rowland	G. C. Breed	Louisville, Ky.
Clarksville Division	Jas. Montgomery		Bowling Green, Ky.
Memphis Division	J. T. Flynn		Memphis, Tenn.
Nashville & Decatur Division	James Geddes		Nashville, Tenn.
So. & North Ala. Division	Robert Meek		Birmingham, Ala.
Louisville, Cin. & Lexington	J. McLeod	J. McLeod	Louisville, Ky.
Louisville, New-Albany & Chicago		J. R. Parker	New-Albany, Ind.
Louisville, Paducah & Southwestern	D. F. Whitcomb	D. F. Whitcomb	Louisville, Ky.
M			
Macon & Brunswick	John A. Grant		Macon, Ga.
Maine Central	Payson Tucker		Portland, Me.
Manchester & Lawrence	H. E. Chamberlin		Concord, N. H.
Marietta & Cincinnati	W. W. Peabody	S. L. Campbell	Cincinnati, Ohio.
Marietta, Pittsburg & Cleveland	Jas. McArthur	R. B. Hoover	Marietta, Ohio.
Marquette, Houghton & Ontonagon	*Samuel Schoch	Jas. S. Mott	Marquette, Mich.
Maryland & Delaware	J. L. Caldwell	J. L. Caldwell	Easton, Md.
Memphis, Carthage & North-Western	E. H. Brown		Carthage, Mo.
Memphis & Little Rock	W. E. Smith	W. E. Smith	Memphis, Tenn.
Memphis & Charleston	W. J. Ross		Memphis, Tenn.
Michigan Central	W. B. Strong		Chicago, Ill.
Michigan Central	‡J. R. Ledyard	Allan Bourn	Detroit, Mich.
Grand River Valley Division	C. B. Bush		Jackson, Mich.
Air-Line, So. Bend & Joliet	E. C. Brown		Jackson, Mich.
Bay City Division	D. J. Chase		Detroit, Mich.
Jackson, Lansing & Saginaw Div.	C. B. Bush		Jackson, Mich.
Mackinaw Division	T. B. Sargent		Bay City, Mich.
Michigan Lake Shore	D. P. Clay, *receiver*		Grand Rapids, Mich.
Midland Railway of Canada	H. G. Taylor		Port Hope, Ont.
Midland Pacific	J. N. Converse	M. A. Showers	Nebraska City, Neb.
Milwaukee, Lake Shore & Western	H. G. H. Reed		Milwaukee, Wis.
Mineral Point	G. W. Cobb	G. W. Cobb	Mineral Point, Wis.
Mineral Range	J. H. Macdonald		Hancock, Mich
Mississippi & Tennessee	M. Burke	M. Burke	Memphis, Tenn.
Missouri, Iowa & Nebraska	Col. Henry Hill		Warsaw, Ill.
Missouri, Kansas & Texas	A. B. Garner	G. M. Babcock	Sedalia, Mo.
Cherokee Division	L. H. Sheldon		Parsons, Kansas.
Choctaw Division	S. G. Eddy		Dennison, Texss.
Missouri Division	J. J. Frey		Sedalia, Mo.
Sedalia Division	J. J. Frey		Sedalia, Mo.
Neosho Division	L. H. Sheldon		Parsons, Kansas.
Osage Divsion	C. M. Sheafe		Holden, Mo.
Missouri Pacific	A. A. Talmage	C. W. Rogers	St. Louis, Mo.
Missouri River, Fort Scott & Gulf	B. S. Henning	A. H. Campbell	Kansas City, Mo.
Missouri River, Fort Scott & Gulf	*Geo. H. Nettleton		Kansas City, Mo.
Mobile & Ohio	*A. L. Rives		Mobile, Ala.
Alabama Division	J. S. Walker		Mobile, Ala.
Mississippi Division	E. S. Hosford		Macon, Miss.
Tenn. & Ky. Division	Cecil Fleming		Jackson, Tenn.
Mobile & Girard	W. L. Clark		Columbus, Ga.
Mobile & Montgomery	G. Jordon	G. Jordon	Montgomery, Ala.
Montgomery & Eufaula	B. Dunham	B. Dunham	Montgomery, Ala.
Morgan's Louisiana & Texas		C. A. Whitney & Co.	New-Orleans, La.
N			
Nashville, Chattanooga & St. Louis	J. W. Thomas		Nashville, Tenn.
Naugatuck	G. W. Beach		Bridgeport, Ct.
New-Brunswick & Canada	John Stewart		St. Stephens, N. B.
New-Bedford	*H. A. Blood		Fitchburg, Mass.
New-Haven & Derby	E. S. Quintard		New-Haven, Ct.
New-Haven & Northampton	C. N. Yeamans	C. N. Yeamans	New-Haven, Ct.
New-Jersey & New-York	W. D. Beasley		Jersey City, N. J.
New-Jersey Midland	W. E. Lewis	R. H. Chipman	Wortendyke, N. J.
New-Jersey Southern	*W. S. Sneden		Long Branch, N. J
New-Orleans & Selma	T. H. Du Puy		Selma, Ala.
New-Orleans, St. Louis & Chicago	*E. D. Frost	S. H. Edgar, V. P.	New-Orleans, La.
New-Orleans & Mobile	D. B. Robinson	John J. Howell	Mobile, Ala.
New-York & Harlem	Chas. M. Bissell	R. C. Moore	New-York, N. Y.
New-York, New-Haven & Hartford	E. M. Reed	R. N. Dowd	New Haven, Ct.
N. Y. & N. H. Division	John T. Moody		New-York, N. Y.
Hartford Division	C. S. Davidson		Hartford, Ct.
Shore Line Division	W. H. Stephenson		New-Haven, Ct.
New-York, Boston & Montreal	C. L. Kimball		Dutchess Jn., N. Y.
New-York Central & Hudson River	J. Tillinghast		Albany, N. Y.
Hudson River Division	J. M. Toucey	C. V. DeForest	New-York.
Eastern Division	Zenas C. Priest		Utica, N. Y.
Syracuse & Rochester Division	G. H. Burrows		Syracuse, N. Y.
New-York & New-England	H. M. Britton	W. W. McKim	Boston, Mass.
Worcester Division	P. St. M. Andrews		Worcester, Mass.
New-York & Oswego Midland			New-York, N. Y.
Middle Division	H. M. Flint		Middletown, N. Y.
Western Division			Oswego, N. Y.
New-York, Kingston & Syracuse	F. J. Hecker		Rondout, N. Y.
New-York, Providence & Boston	A. S. Matthews	A. S. Matthews	Stonington, Ct.
New Brunswick	Tho. Hoben	W. R. Logan	Fredericton, N.B.
Northern Pacific		E. F. Williams	St. Paul, Minn.
Minnesota Division	H. A. Towne		Brainerd, Minn.
Northern Pacific Division	*J. W. Sprague		Kalama, W. T.
Lake Superior & Miss. Division	George H. Smith		St. Paul, Minn.
North-Pennsylvania	S. W. Roberts	F. A. Cornby	Philadelphia, Pa.
Northern Canada	†F. W. Cumberland		Toronto, Can.
North Carolina	A. B. Andrews		Comp' Shops, N. C.
Northern Central	*Frank Thomson	A. W. Sumner	Philadelphia, Pa.
Northern (New-Hampshire)	George E. Todd		Concord, N. H.
North-Eastern (South-Carolina)			Charleston, S. C.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
O			
Ohio & Mississippi	E. H. Waldron.		St. Louis, Mo.
Oil Creek & Alleghany River	C. J. Hepburn		Pittsburg, Pa.
Old Colony	J. R. Kendrick		Boston, Mass.
Omaha & North-Western	J. E. House		Omaha, Neb.
Oregon & California	J. Brandt, Jr.		Portland, Oregon.
P			
Paducah & Memphis	J. W. Wilbur		Paducah, Ky.
Painesville & Youngstown	L. F. McAleer		Painesville, Ohio.
Paris & Danville	B. F. Matthias		Paris, Ill.
Paris & Danville		B. L. Baldwin	Danville, Ill.
Passumpsic	G. A. Merrill		Lyndonville, Vt.
Pennsylvania	G. Clinton Gardner		Altoona, Pa.
Pennsylvania	*Frank Thomson	Enoch Lewis	Philadelphia, Pa.
New-Jersey Division	F. Wolcott Jackson		Jersey City, N. J.
Philadelphia Division	W. F. Lockard		Philadelphia, Pa.
Middle Division	J. N. McCrea		Harrisburg, Pa.
Pittsburg Division	Rob't Pitcairn		Pittsburg, Pa.
Tyrone Division	S. S. Blair		Tyrone Pa
Bedford Division	S. M. Prevost		Bedford, Pa.
West Pennsylvania Division	J. McC. Creighton		Allegheny City, Pa.
Pennsylvania & New-York Canal	A. Mitchell		Wilkesbarre, Pa.
Pensacola & Louisville	C. S. Williams		Pensacola, Fla.
Peoria & Rock Island	John R. Hilliard		Peoria, Ill.
Peoria & Rock Island	J. R. Hilliard, *Rec. and P. Agt.*		Peoria, Ill.
Peoria, Pekin & Jacksonville	John Allen	John Allen	Pekin, Ill.
Petersburg	H. F. Douglas	W. P. Taylor	Petersburg, Va
Philadelphia & Reading	J. E. Wootten	W. S. Wilson	Philadelphia, Pa.
Catawissa & Williamsport Br'ch	D. C. Reinhart		Williamsport, Pa.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Lebanon & Tremont	H. W. Tracy		Pine Grove, Pa.
Philadelphia and Baltimore Central	Henry Wood	Henry Wood	Philadelphia, Pa.
Philadelphia & Erie	W. A. Baldwin		Williamsport, Pa.
Philadelphia & Erie		Enoch Lewis	Philadelphia, Pa.
Western Division	J. W. Reynolds		Erie, Pa.
Middle Division	Edmund L. Tyler		Renovo, Pa.
Eastern Division	Thomas Gucker		Williamsport, Pa.
Philadelphia, Wilmington & Baltimore	H. F. Kenney		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis	J. H. Barrett	Wm. Mullins	Pittsburg, Pa.
Pittsburg, Cincinnati & St. Louis	*D. C. Caldwell		Columbus, Ohio.
Eastern Division	Jas. R. Shaler		Denison, Ohio.
Little Miami Division	J. D. Ellison		Cincinnati, Ohio.
Western Division	Jas. R. Shaler		Dennison, Ohio.
Pittsburg, Washington & Baltimore	E. K. Hindman		Connellsville, Pa.
Pittsburg, Ft. Wayne & Chicago	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Eastern Division	George Webb		Pittsburg, Pa.
Western Division	C. D. Gorham		Fort Wayne, Ind.
Port Royal	R. G. Fleming		Augusta, Ga.
Portland & Ogdensburg	J. Hamilton	John E. Donnell	Portland, Maine.
Portland & Rochester	J. M. Lunt	W. H. Turner	Portland, Maine.
Portsmouth, Great Falls & Conway	J. W. Sanborn		Portsmouth, N. H.
Portsmouth	H. E. Chamberlin		Concord, N. H.
Poughkeepsie, Hartford & Boston	J. A. Perkins	A. W. Cable	Poughkeepsie, N Y
Providence & Worcester	W. D. Hilton	W. D. Hilton	Providence, R. I
Providence, Warren & Bristol	Waterman Stone		Providence, R. I.
Q			
Quincy, Alton & St. Louis	N. J. T. Dana	N. J. T. Dana	Quincy, Ill.
Quincy, Missouri & Pacific	J. R. Buchanan		Quincy, Ill.
R			
Raleigh & Augusta Air-Line	J. C. Winder		Raleigh, N. C.
Raleigh & Gaston	J. C. Winder		Raleigh, N. C.
Richmond, York River & Chesapeake	H. T. Douglas	Hugh Graham	Richmond, Va.
Richmond & Danville	T. M. R. Talcott		Richmond, Va.
Richmond, Fred. & Potomac	E. T. D. Myers	T. L. Courtney	Richmond, Va.
Richmond & Petersburg	Augustus Shaw		Richmond, Va.
Rockford, Rock Island & St. Louis	W. H. Ferry, Receiver	A. E. Lyford	Rock Island, Ill.
Northern Division	Henry Looseley		Rock Island, Ill.
Southern Division	Geo. L. Walker		Beardstown, Ill.
Rome, Watertown & Ogdensburg	J. W. Moak		Watertown, N. Y.
S			
St. Lawrence & Ottawa	R. Luttreil		Prescott, Can.
St. Joseph & Denver City	*L. D. Tuthill		St. Joseph, Mo.
St. Paul & Pacific	E. Q. Sewell	E. C. Becker	St. Paul, Minn.
St. Paul & Sioux City	J. F. Lincoln	J. F. Lincoln	St. Paul, Minn.
St. Louis, Alton & Terre Haute	W. G. Broughton		St Louis, Mo.
St. Louis, Iron Mountain & Southern	Arthur W. Soper	W. S. Cuddy	St. Louis, Mo.
St. Louis, Iron Mountain & Southern	*A. W. Soper		St. Louis, Mo.
St. Louis & South-Eastern	R. H. G. Minty	A. G. Thompson	Evansville, Ind.
St. Louis Division	George S. Winslow		Evansville, Ind.
St. Louis, Kansas City & Northern	Thos. McKissock	R. W. Green	St. Louis, Mo.
St Louis Division	W. H. Vaughan		St. Louis, Mo.
Western Division	C. L. Dunham		Kansas City, Mo.
St. Louis, Keokuk & Northwestern	Guy Wells		Keokuk, Ia.
St. Louis, Vandalia, Terre Haute & Ind	John E. Simpson	C. R. Peddle	Indianapolis, Ind.
St. Louis, Lawrence & Western	E. C. Devereaux		Lawrence, Kan.
St. Louis, Salem & Little Rock		H. A. Crawford	St. Louis, Mo.
St. Louis, Salem & Little Rock	J. W. Blanchard		Steelville, Mo.
Sacramento Valley & P. & S. V.	F. A. Bishop		Sacramento, Cal.
Saginaw Valley & St. Louis	N. W. Merrill.	N. W. Merrill.	Saginaw, Mich.
San Francisco & Northern Pacific	A. A. Bean	F. H. Gudes	Petaluma Cal.
San Rafael & San Quentin.	David Nye		San Rafael, Cal.
Savannah & Charleston	C. S. Gadsden		Charleston, S. C.
Seaboard & Roanoke		E. G. Ghio	Baltimore, Md.
Selma, Marion & Memphis	E. W. Rucker	E. W. Rucker	Marion, Ala.
Selma, Rome & Dalton	M. Stanton		Selma, Ala.
Sheboygan & Fond du Lac			Fond du Lac, Wis.
Shenango & Allegheny	I. T. Blair		Greenville, Pa.
Sioux City & Pacific	L. Burnett	L. Burnett	Missouri Valley, Ia.
Sodus Point & Southern	*S. J. Macy		Sodus Point, N. Y.
South-Shore	J. R. Kendrick		Boston, Mass.
South Carolina	S. S. Solomon	A. Mitchell	Charleston, S. C.
Southern Central	Jas. G. Knapp		Auburn, N. Y.
Southern, of Long Island	I. D. Barton		Hunter's Point, L. I
Southern, of Long Island		A. E. Godeffroy	New-York City.
Southern Minnesota	W. C. Van Horne		La Crosse, Wis.
Southern Pacific of California	A. N. Towne		Sacramento, Cal.
North Division	A. C. Bassett		San Francisco, Cal.
Los Angeles Division	E. E. Hewitt		San Francisco, Cal.
Southwestern of Georgia	Virgil Powers		Macon, Ga.
Spartanburg & Union	W. W. Davies		Spartanburg, S. C.
Springfield Athol & Northeastern	John W. Phelps		Springfield, Mass.
Springfield & North-Western	*A. J. Ware		Pekin, Ill.
Staten Island	J. W. Wilbur		New-York, N. Y.
Stockton & Ione	W. G. Miller		Stockton, Cal.
Stonington & Providence	A. S. Mathews	A. S. Mathews	Stonington, Ct.
Sullivan & Erie	Wm. Stevenson		Towanda, Pa.
Summit County	W. M. Riter		Coalville, Utah.
Syracuse Northern	J. W. Moak		Syracuse, N. Y
Syracuse, Binghamton & New-York	T. Voorhees		Syracuse, N. Y
T			
Tennessee & Pacific	George Maney		Nashville, Tenn.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	Geo. H. Noble		Marshall, Texas
Tioga	L. H. Shattuck		Blossburg, Pa.
Toledo, Peoria and Warsaw	A. L. Hopkins, *Receiver*		Peoria, Ill.
Western Division	David K. Smith		Peoria, Ill.
Western Division	William E. Dorwin		Warsaw, Ill.
Toledo, Wabash & Western	Robert Andrews	J. T. Sterling	Toledo, Ohio.
Eastern Division	K. H. Wade		Lafayette, Ind.
Western Division	C. W. Bradley		Springfield, Ill.
Toledo, Canada Southern & Detroit	D. Edwards		Toledo, Ohio.
Troy & Boston	C. W. Moseley		Troy, N. Y.
Toronto, Grey & Bruce	N. Weatherston	W. Watson	Toronto, Can.

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Wilmington, Columbia & Augusta	James Anderson	James Anderson	Wilmington, N. C.
Wilmington & Weldon	J. F. Devine		Wilmington, N. C.
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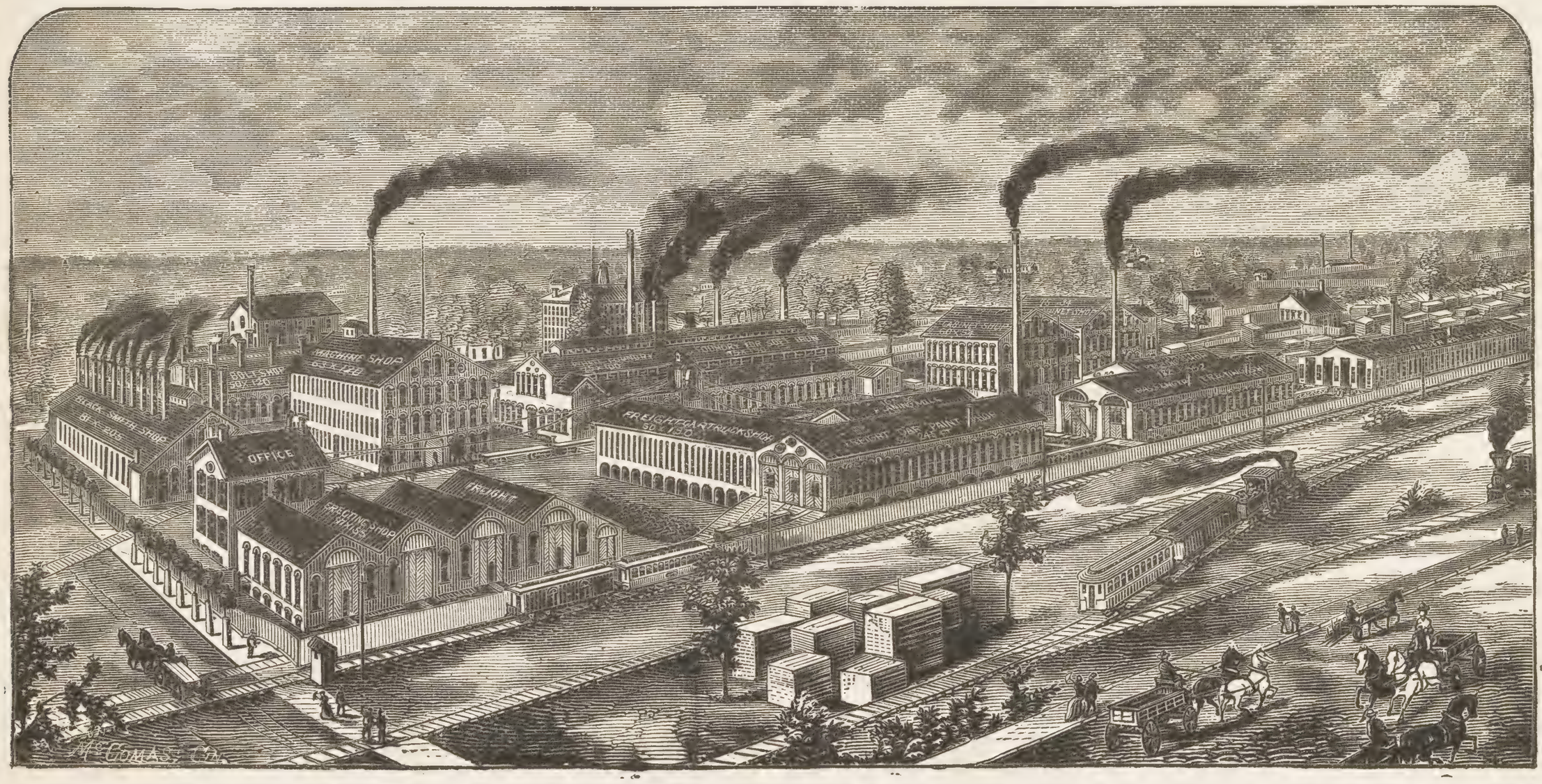
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Grounds Occupied, 18 Acres,
Capacity 15 Freight Cars & 160 Car-Wheels per day.

10 Passenger and Baggage per Month.
EMPLOY 1000 MEN.
Six Million feet of Lumber in Store.



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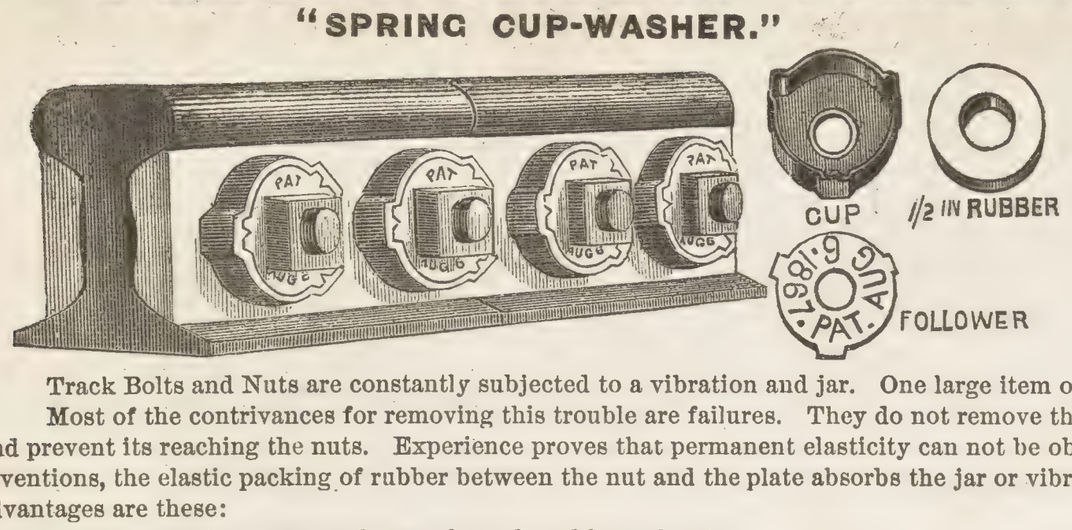


HAWKES' PATENT FOUNTAIN PEN-HOLDER.

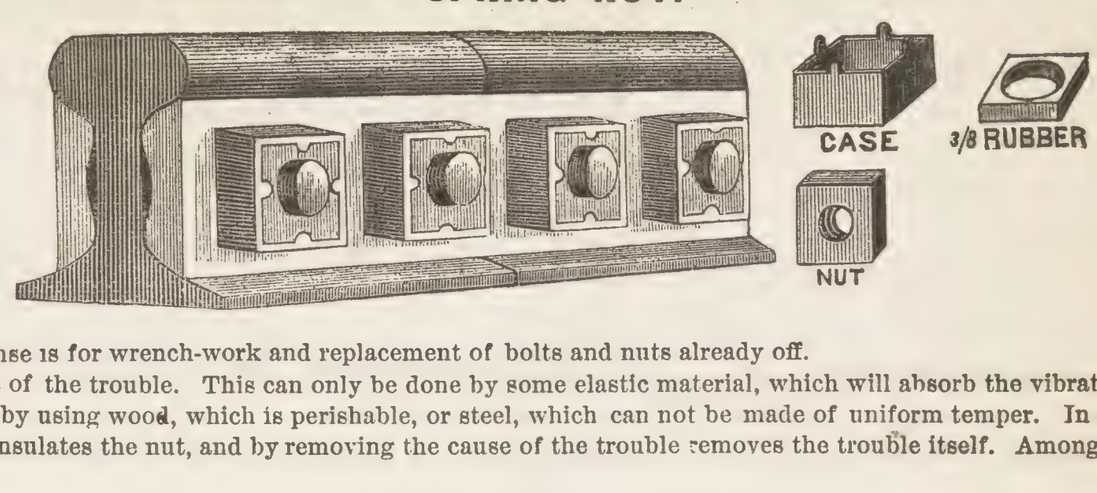
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PRATT'S PATENT COMPENSATING FISH-PLATE JOINTS.

"SPRING CUP-WASHER."



"SPRING NUT."



Track Bolts and Nuts are constantly subjected to a vibration and jar. One large item of expense is for wrench-work and replacement of bolts and nuts already off.

Most of the contrivances for removing this trouble are failures. They do not remove the cause of the trouble. This can only be done by some elastic material, which will absorb the vibration and prevent its reaching the nuts. Experience proves that permanent elasticity can not be obtained by using wood, which is perishable, or steel, which can not be made of uniform temper. In our inventions, the elastic packing of rubber between the nut and the plate absorbs the jar or vibration, insulates the nut, and by removing the cause of the trouble removes the trouble itself. Among its advantages are these:

1st. It saves the expense of wrench-work and loss of nuts.
2d. The rubber absorbs the blow given by the wheels at the joint, in such manner as to prevent fracture of rails at the joint, and accidents resulting therefrom.
3d. The track is made noiseless.
4th. Rails are saved from pounding out at the ends, and the thread of the bolts and nuts from stripping.

The practical value of these inventions is more fully demonstrated by the two million joints now long in use.

Manufactured and Sold by

THE PRATT MANUFACTURING COMPANY,

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Manufacturers and Dealers in all kinds of RAILWAY TRACK SUPPLIES; also, New-York Agents for the Tuttle & Whittemore Co., Naugatuck Conn. Manufacturers of REFINED MALLEABLE IRON CASTINGS, from Patterns to order.

Special attention given to MALLEABLE IRON CASTINGS for Railroad Car construction.

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Special attention is called to our Patent **CLIFF ELLIPTIC SPRINGS** for Freight and Passenger service. See advertisement, page ii.

Steel Rails, Locomotive and Car Tires, Elliptic Springs and Cast Steel of all descriptions.

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(New-Haven Railroad Freight Depot),

MANUFACTURERS OF

BRASS COCKS

For Steam, Water, and Gas.

☞ *Illustrated Catalogue and Price-List furnished on application.*

VULCANIZED FIBRE COMPANY,

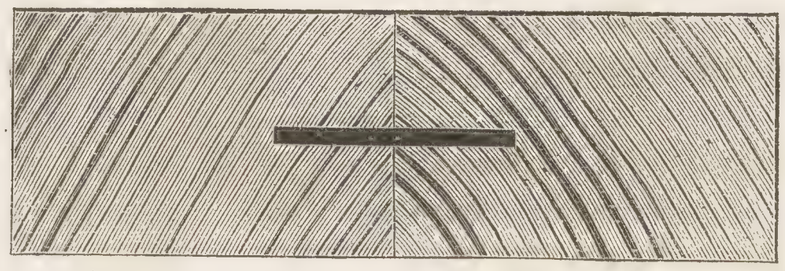
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Elastic Fish-Bolt Washers,

RAILROAD CAR-AXLE WASHERS,

Gibs for Engines, Pump-Valves, Sheet Packing, etc. Also Water-Tight Joints for Floors, Tanks, and

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This Joint is made by inserting a tongue of ***Vulcanized Fibre*** in grooves sawed in the corresponding edges of two boards. When any dampness or water comes in contact with the Fibre tongues, *it at once swells, and packs the Joint tight.* Shrinkage of lumber does not affect the tightness of the Joint.

Our ***Engine Gibs*** cost only one fourth as much as brass, require only one half the oil; do not cut the slides, and outwear every other material.

Send for circular, samples, etc.

DITTMAN'S

STAR NUT-LOCK.

Fig. 1

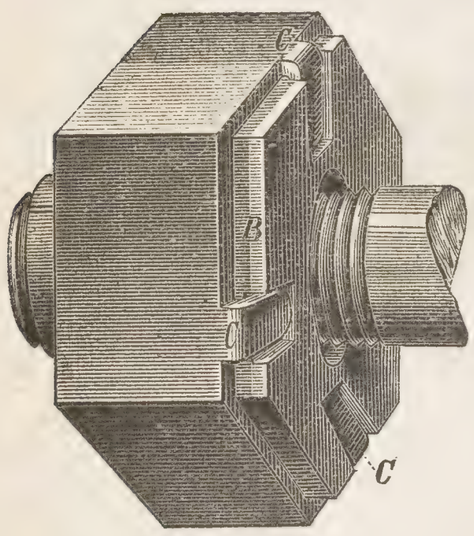
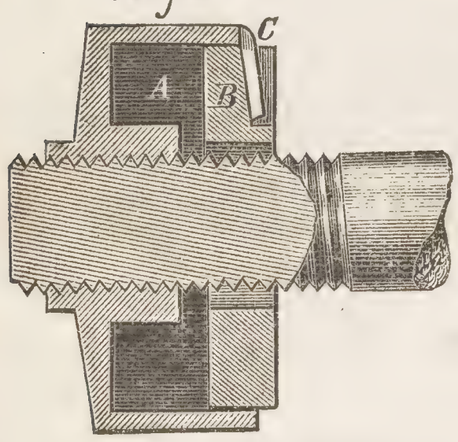


Fig. 2



Patented September 8, 1874.

The Nut-Lock herewith illustrated in perspective (Fig. 1) and section (Fig. 2) is so constructed as to prevent the backward rotation of the Nut under the influence of jars and jolts, and also to take up automatically the expansion or contraction of the bolt due to changes of temperature.

This Nut-Lock is not to be used in connection with Fish-Plates for a period of three years and five months, but for all other purposes it can be used. After that period has elapsed, it can be used with Fish-Plates.

We will guarantee the Nut-Lock not to be an infringement on any other invention. All parties infringing on our rights will be dealt with according to law.

License will be granted to manufacture the above Nut and samples furnished upon application to the

STAR NUT-LOCK CO.,

Leacock P. O., Lancaster Co., Pa.

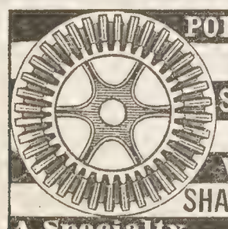
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I challenge all owners of competing brakes to meet me on public trial, at the great Centennial, in 1876. Rights low, as I am sole owner of my patents.

Refer to any one of the executive officers, master-mechanics, conductors, or engineers on the above roads.

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PORTABLE and STATIONARY
STEAM ENGINES, STEAM BOILERS.
SAW, FLOUR AND GRIST MILLS.
MILL GEARING MADE
Without Patterns.
SHAFTING, PULLEYS AND HANGERS
A Specialty.
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SEND FOR CIRCULARS. BALTIMORE, MD.

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AND

Machine Company,

HARRISBURG, PA.

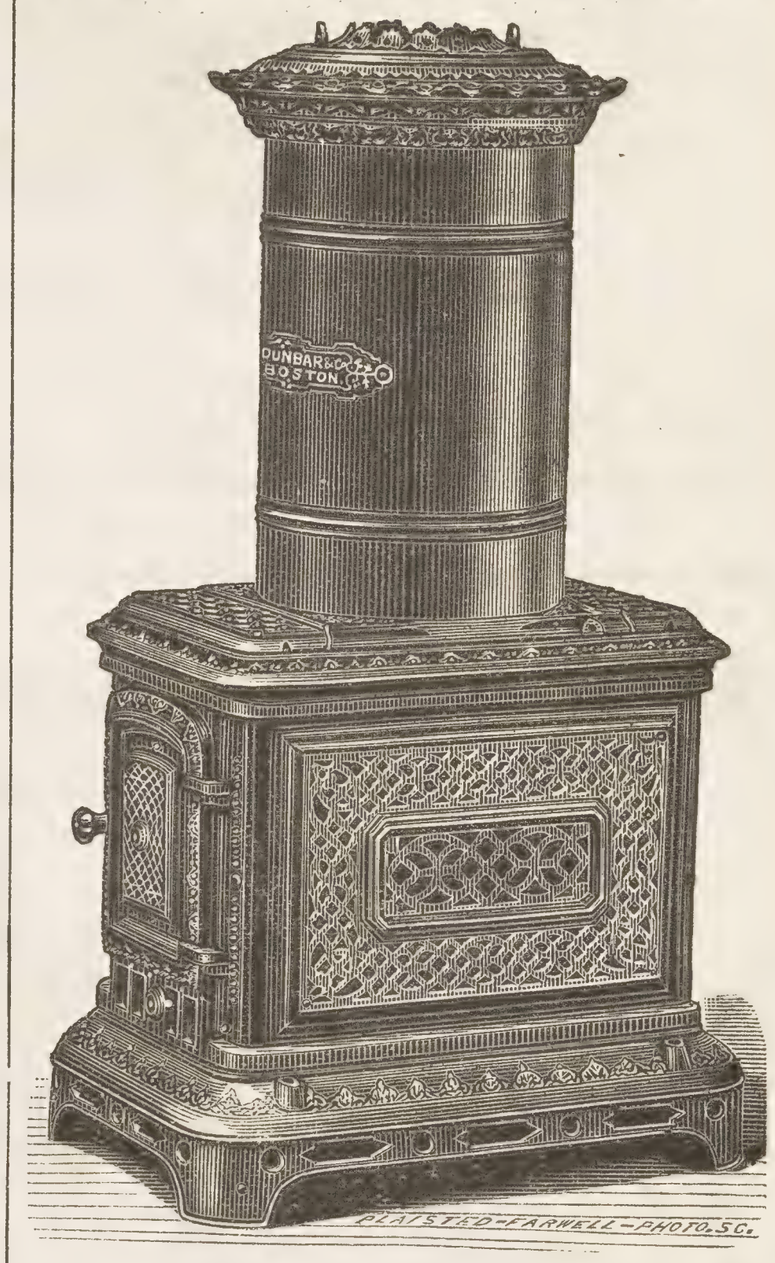
Manufacture all kinds of Machinists' and Car-Builders' Tools, for working Iron, such as Lathes, Planers, Slotting Machines, Horizontal Drilling and Boring Machines, Vertical Drills, all sizes, Shaping Machines, Bolt Cutters, Nut Tappers, Car Wheel Borers, Hydraulic Wheel Press, Axle Lathes, etc. Patent Sectional Tubular Boiler, safety and great economy at moderate cost.

Also Oil Tank Cars, Boiler and Sheet Iron work of all kinds, Foundry Cupolas, Cranes, Ladles, etc.

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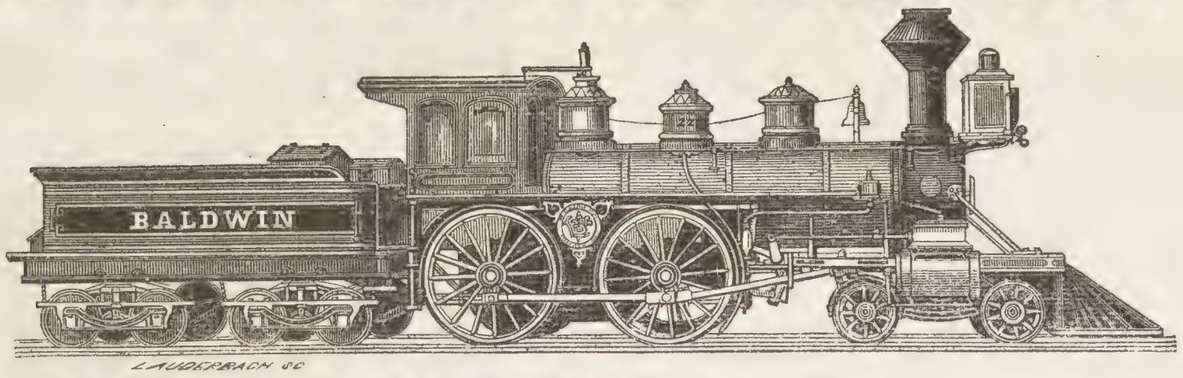
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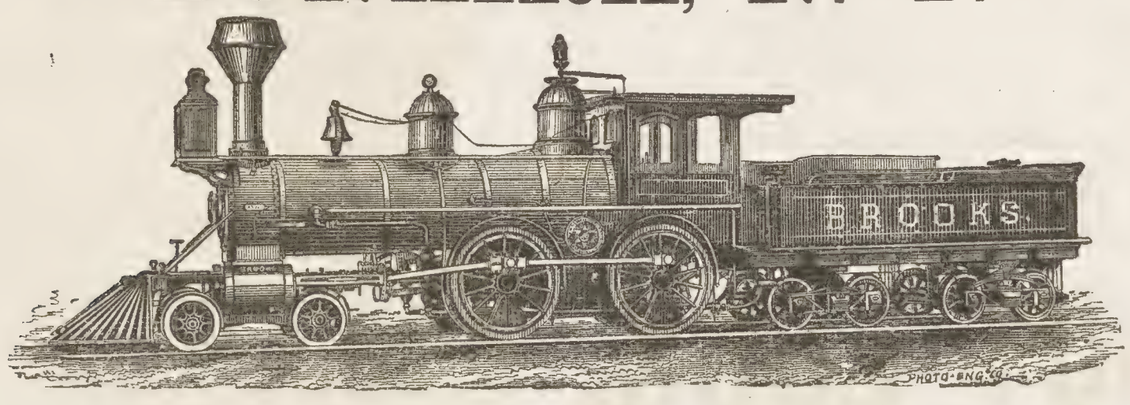
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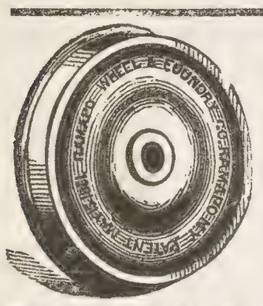
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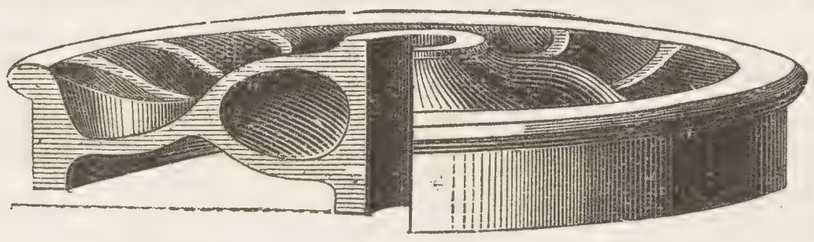
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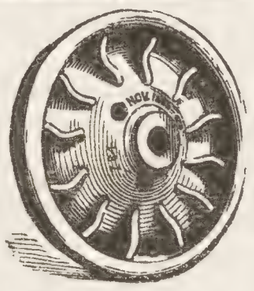


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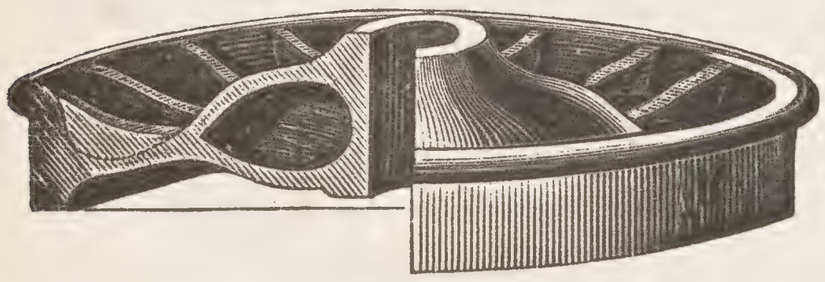
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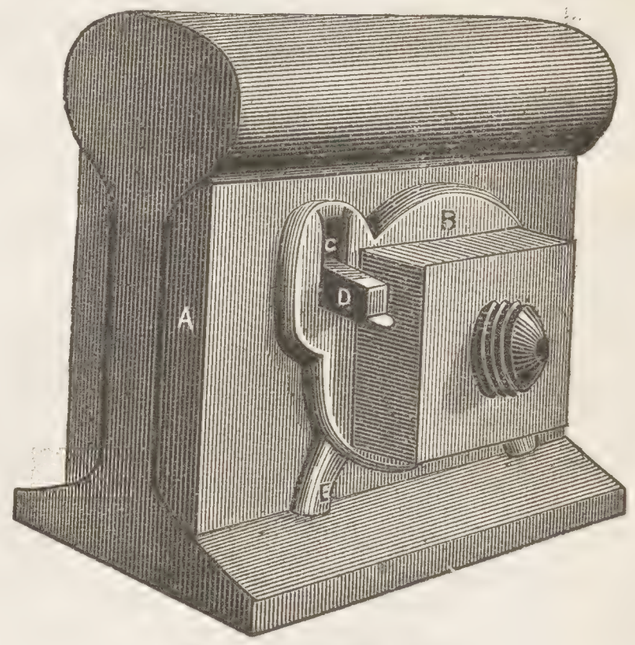
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Safety Washer,

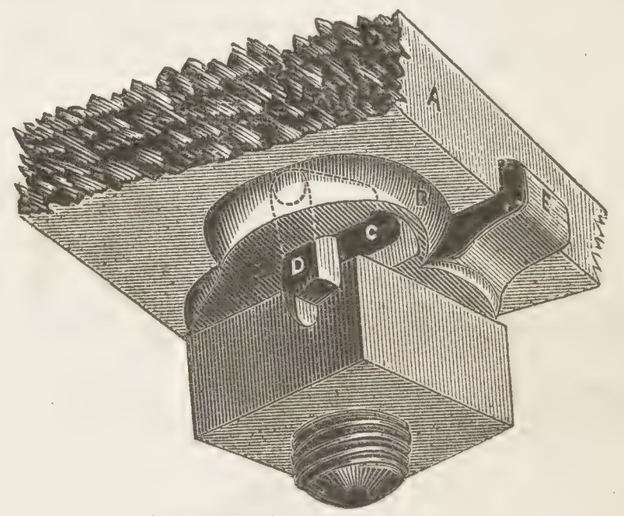
A Positive Nut-Lock, made of Malleable Iron.



For FISH PLATE.

EXPLANATION OF CUT.

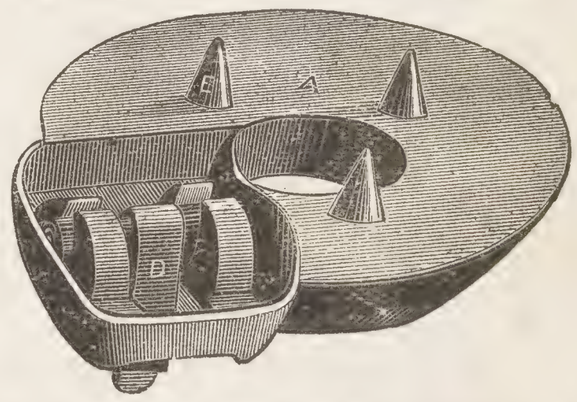
A, Fish plate. *B*, Washer, with projecting feet. *C*, Cavity, into which the dog, *D*, swings, on screwing up the nut. *D*, Pivoted dog which falls by side of nut when screwed home.



CAR TRUCK Washer.

Adapted for use on fish-plate bolts, car trucks, wagons, mowing machines, wood-work of all kinds, or for any purpose where bolts and nuts are used.

Cheap, Effective, and Durable.



Reverse side for WOOD-WORK, showing Method of Pivot Swing.

Will fit on old or new work, no alterations or special tools needed, requiring no rubber or wood for compressing or bending to hold the nut. The dog being in position to lock at any time required, by turning down by the side of the nut when screwed home; should the bolt or thread give any, so as to become loose, the dog will still hold the nut from turning back, and the nut can be screwed up as readily as by the old method.

Have been practically tested for two and a half years on many Railroads, giving unqualified satisfaction, one Railroad alone having them on over 2,500 cars

Cast-iron washers for timber or bridges furnished to any size or weight.

Samples and price-lists forwarded on application to

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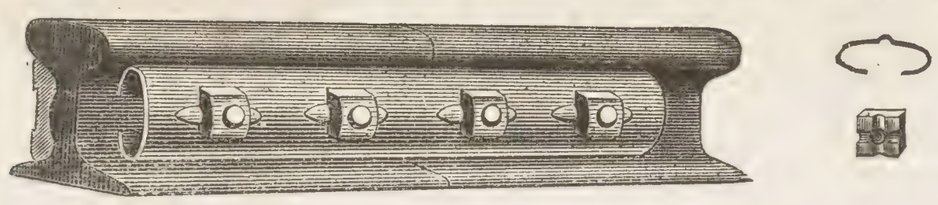
MANAGER OF

Safety Washer Manufacturing Company,

No. 311 MAIN STREET,

BUFFALO, N. Y.

THE GIANT SPRING FISH-PLATE JOINT.

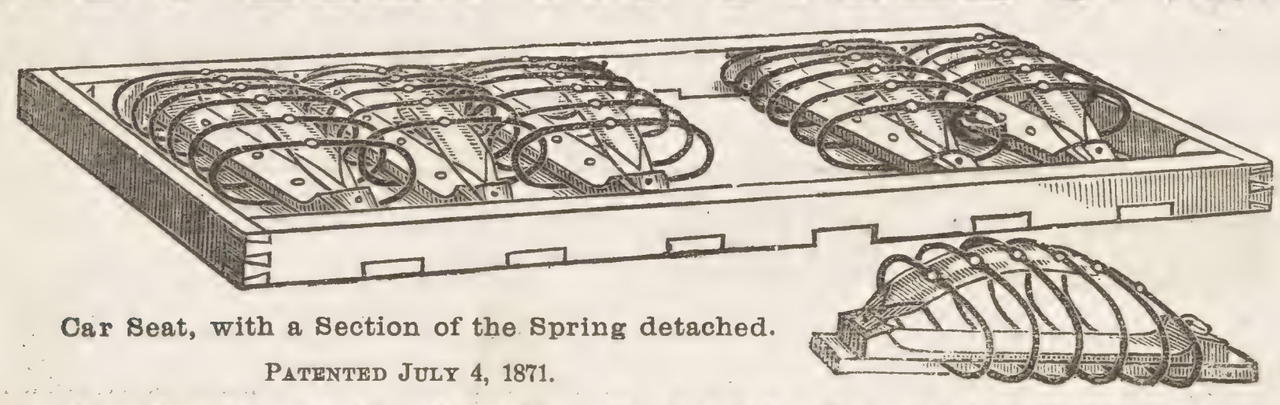


A Combined Nut-Lock and Fish-Plate. The Nuts are securely held in place by a Steel Plate or Rib, and protected from jar and vibration. Costs no more than ordinary wrought-iron plates.

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COBB'S ELLIPTIC STEEL SPRING.



Car Seat, with a Section of the Spring detached.

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FOR CAR SEATS AND SPRING MATTRESSES FOR SLEEPING CARS.

These Springs have been in successful operation on a large number of the leading railroads in the United States for over three years.

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A. B. PULLMAN.

Z. COBB & SONS, 292 West Adams Street, CHICAGO.

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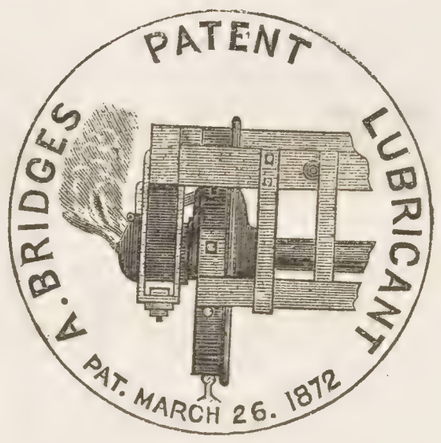
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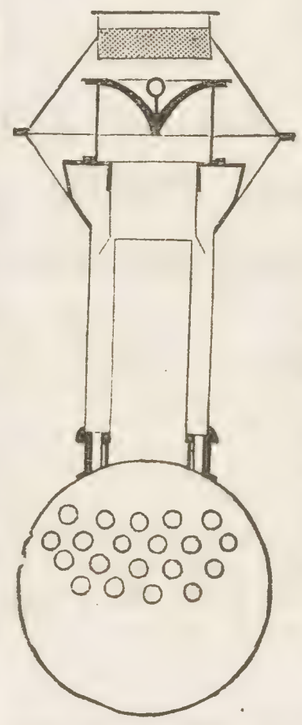
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DOWN, ANGULAR & CROSS-FEED,
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For Coal and Wood Burning Locomotives.



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Railroad Companies wishing to use them can be furnished with working drawings by sending size of cylinder of engines to be used upon.

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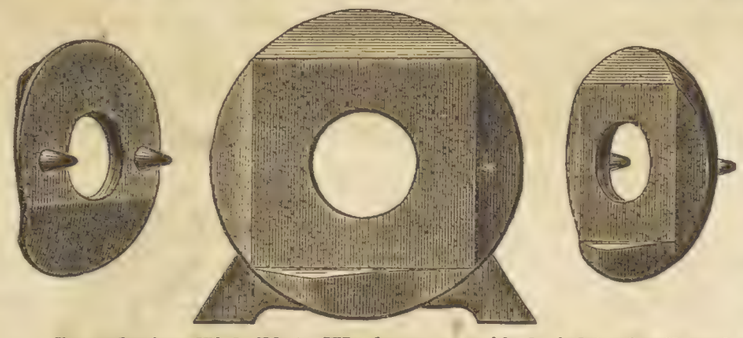
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The only absolutely Perfect Nut-Lock in the market, combining Economy, Simplicity, and Perfect Safety.

The large cut represents the Fish-Plate Washer; the small one on the right is adapted to wood, a bottom view of which is shown in the left-hand cut with beveled side, and the spurs which penetrate the wood. They are in use on a number of Railroads, and give entire satisfaction, supplying the place of Jam-nut and Washer on wood, besides being cheaper and decidedly better. On Fish-Plates, the cost is about the same as that of the Jam-nut.

In ordering Fish-Plate Washers, specify height of rail and square of nut. In all other cases use M. C. B.'s standard size nut, flat side next the washer.

⅝ inch Nut, - - 1⅛ inch square.
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1 " " - - 1⅞ " "

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See INDEX TO ADVERTISEMENTS, Second Page of Cover.

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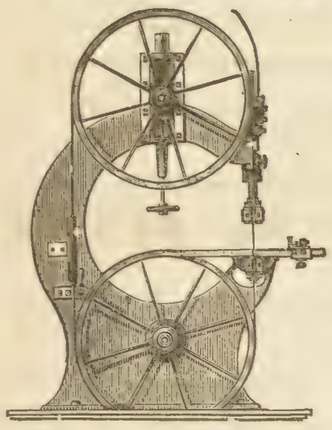
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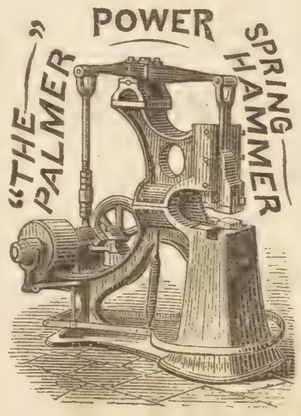
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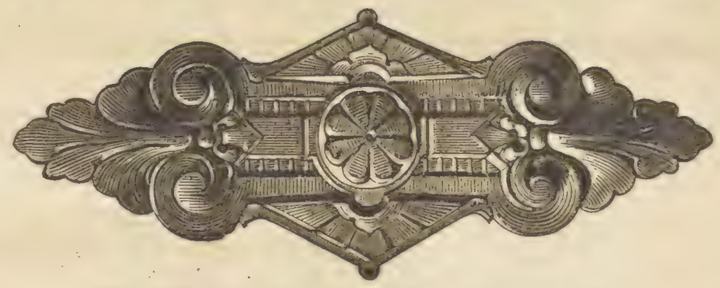
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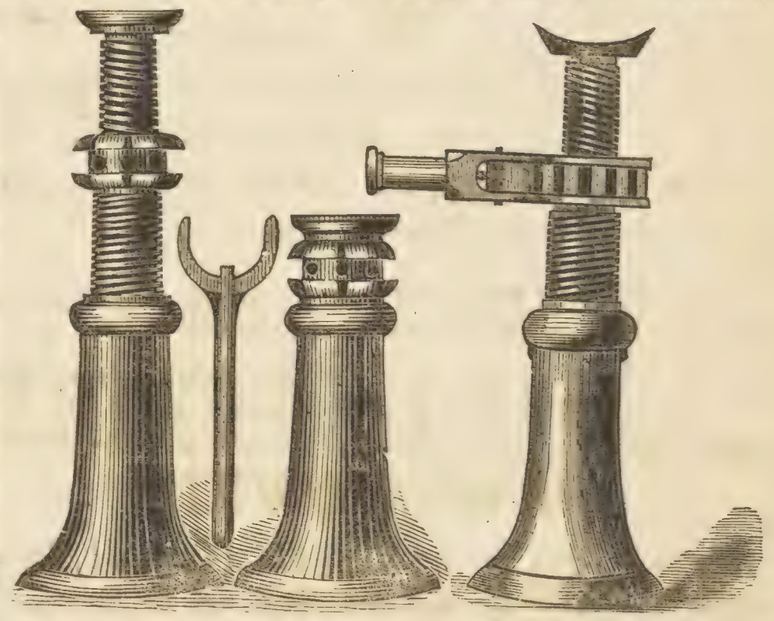
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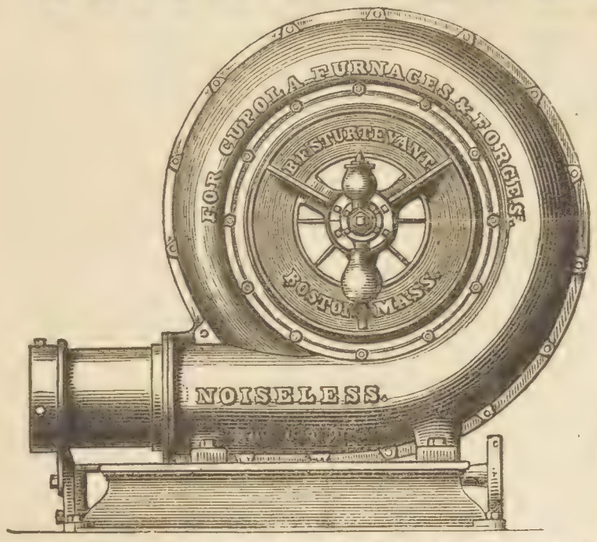
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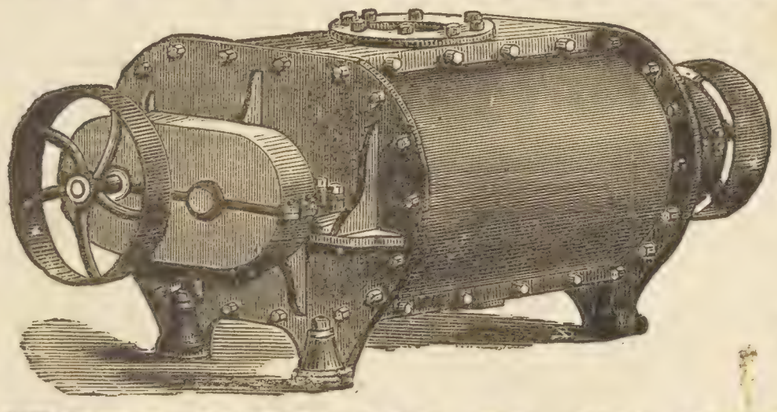
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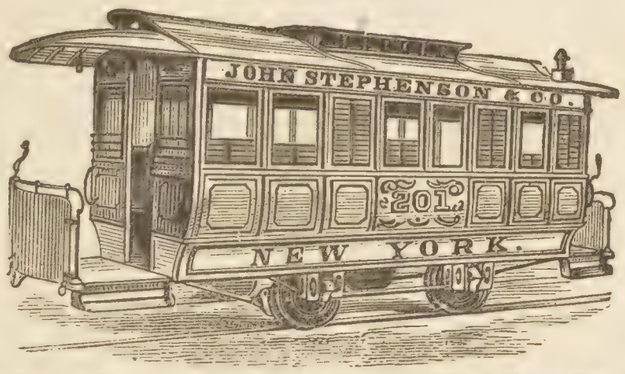
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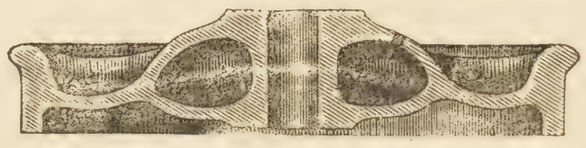


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